North Elevation

WOODFOLD VILLA

for Mr. Hussain

SHAW & JAGGER ARCHITECTS

PROPOSED PRIVATE DWELLING

Land Adjacent to Woodfold Park, Blackburn

The Proportion of Classical Architecture

February 2024

About the Author - Francis Shaw

Francis Shaw, the author of this report and designer of Woodfold Villa, possesses demonstrable expertise and competence in the use of the classical orders and the design of a Palladian Country House. He is an architect with 43 years' architectural experience, qualified for 35 years and has worked on a number of scheduled ancient monuments. One of these, Hellifield Peel, was the first to be converted to a private residence post WW2 and was featured on Channel 4's Grand Designs programme. He has also worked on many Grade I listed country houses, including Sundridge Park by John Nash with a Humphrey Repton landscape, and on other historic structures including castles at Mingary (also scheduled monument) and Loudoun in Scotland.

He has designed a series of NPPF Paragraph 84(e) houses (formerly paragraph 55, 79 and 80) along with Paragraph 139 (formerly paragraph 134) designs. He has successfully guided schemes in World Heritage sites, National Landscapes (formerly AONBs) and listed settings to approval. He has also carried out a series of commissions for new build Palladian/Georgian villas in Yorkshire and the Midlands. Francis's thesis at Bristol University was on Rationalism and the use of the Classical language and, at Edinburgh his MA thesis was on Sacred Geometry. Work from his MA thesis has featured in various publications. He has also written articles for many national newspapers including the Sunday Times and his work for Shaw & Jagger Architects has featured in newspapers, magazines and books.

The Proportion of Classical Architecture ('Logos Opticos': The Logic of composition. Vitruvius 'De Architectura', bk.1, ch.1, para. 16)

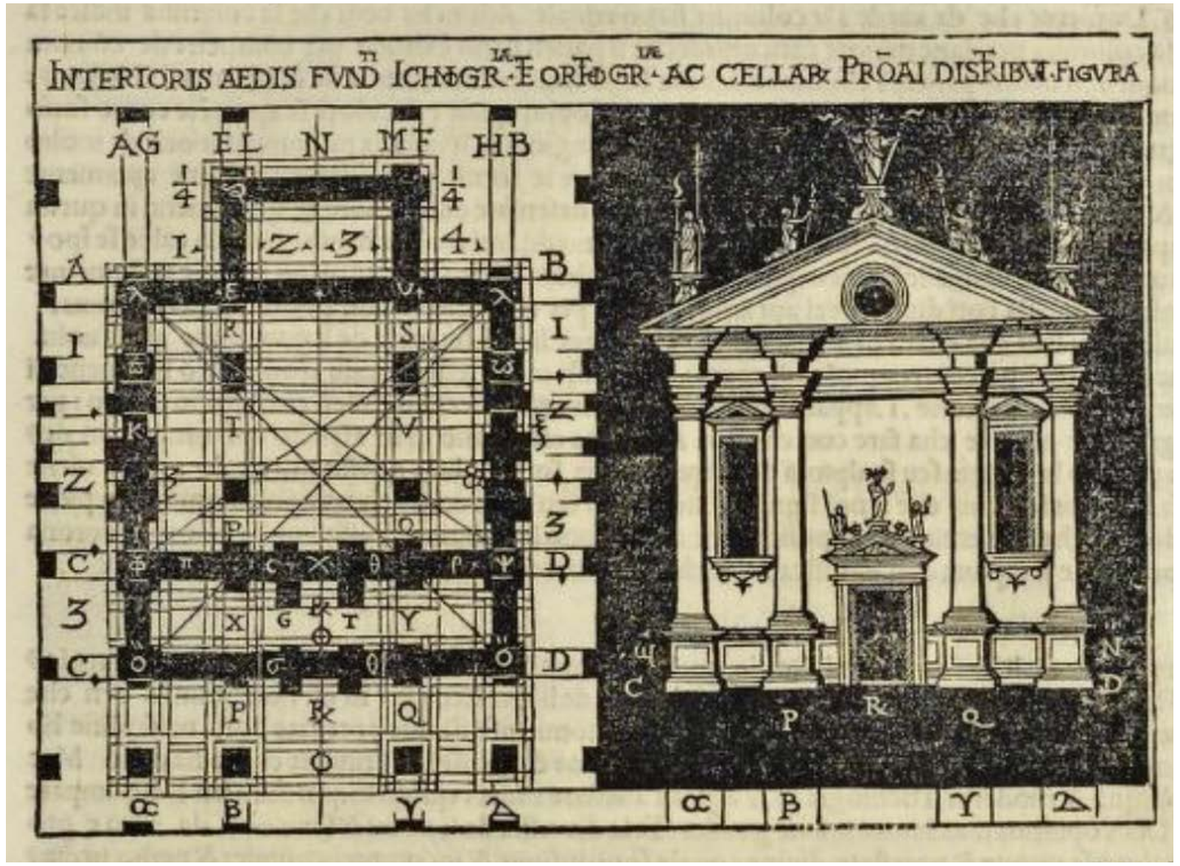
1. The purpose of this report is to establish why the design of Woodfold Villa is an exemplary essay (a composition in geometry) in classical architecture. This is because the majority of Georgian or Palladian Country houses were designed using 'pattern books' (such as Batty Langley) or proportion systems, rules of thumb, set out in the various interpretations of Vitruvius. The design of a Georgian Country Villa has evolved from applying the geometry and mathematics derived from Greek philosophers (Plato wrote over the entrance to his academy, 'Let none ignorant of geometry enter here') and mathematicians (Plato's Symposium 1513, Euclid Elements printed in 1482 and The Golden Verses of Pythagoras 1494) and Greek and Roman architecture, primarily from the temple structures or sacred buildings which are predominantly what have survived through over two millennia for architects to study and record their details.

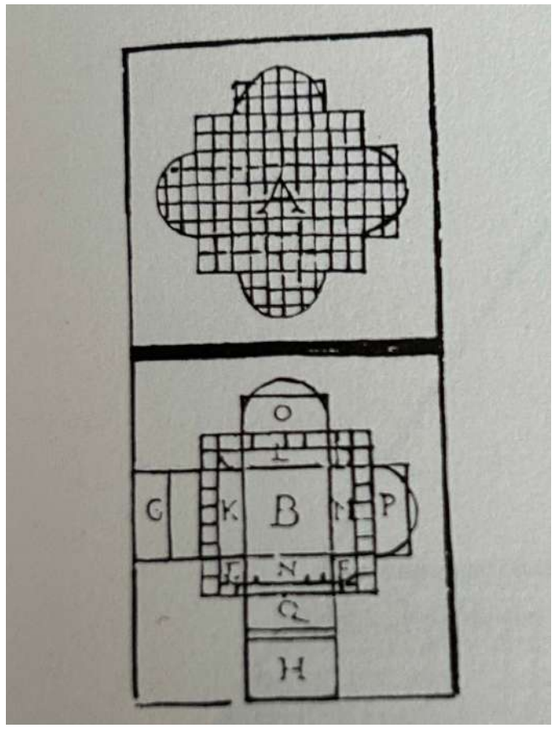
2. Throughout the Middle Ages, many of the great works of the ancients had survived in medieval monastery libraries, copied from ancient texts. Works such as Pythagoras and Vitruvius found favour with Christian theologians, due to the Pythagorean mathematics being limited to whole numbers, that is, definable. Such works formed the foundation of the sacred geometry at the core of the great cathedrals and churches of the gothic era and ensured that the principles of proportion and knowledge of geometry were not lost. The Islamic world also had a huge influence on the western understanding of mathematics and geometry through the cultural exchanges as a result of the crusades. These were from the Arabic translations of 'lost' Greek and Roman texts as well as Arabic advancements in mathematics and understanding of geometry.

"What is God? He is length, width, height and depth" - St Bernard of Clairvaux

3. The Renaissance in Italy was instrumental in 'rediscovering' and 'rescuing' the knowledge of the ancients. The publishing of these important texts and treaties was the bedrock of the Renaissance, allowing a much wider access to the knowledge of the ancients. Euclid's 'Elements' printed in 1482 established the foundations of geometry that influenced the arts until the early 19th century. The Renaissance 'rescued' the true classical orders from antiquity. The treatise of Vitruvius (Marcus Vitruvius Pollio), a Roman architect and engineer from the first century BC, was the only work on architectural theory to survive from antiquity. Vitruvius's work 'De Architectura' came to prominence when the first known Latin edition was published by Fra Giovanni Sulpitus, in Rome in 1486. The work had a profound influence on architects and artists such as Leonardo da Vinci, Michelangelo, Bramante, Vignola and Palladio. The Iconic image of 'Vitruvian man' c1490 is a key to unlocking Vitruvian proportion, including the most successful diagram of 'squaring the circle' yet drawn. Vitruvius stated that all buildings should have three attributes; durability, utility and beauty. He believed that architecture was an imitation of nature. "As birds and bees built their nests, so man built houses from natural materials, that gave them shelter against the elements." He asserted that the Greeks, in perfecting the art of building, had invented the classical orders: Doric, Ionic and Corinthian. It gave them a sense of proportion culminating in an understanding "Beauty is produced by the pleasing appearance and good taste of the whole, and by the dimensions of all the parts being duly proportioned to each other." The most influential edition of Vitruvius's De Architectura was published in 1521 by the architect Cesare Cesariano. Cesariano was an artist, scholar and architect. He provided the first vernacular Italian translation from Latin, which was richly illustrated with the latest contemporary ideas and interpretations of classical language which would shape the future of architecture. Both schemas of taxis, the grid and tripartition are included, Cesariano shows how Vitruvius's grid is applied to building layout (see FIG A).

4. Of the many Architects influenced by Vitruvius, Andrea Palladio (1508-1580) is regarded as greatest exponent of classical architecture of this period. His villas, the Villa Almerico Capra Valmarana (better known as the Villa Rotonda in the Province of Vicenza see FIG B) and the Villa Foscari (better known as the Villa 'La Malcontenta' in the province of Venice), are considered his architecture masterpieces for domestic architecture. Palladio cemented his influence across Italy and Europe in publishing his 'The Four books of Architecture' in 1570, first published in English, by Leoni between 1715-20. Although Vitruvius had been translated into English as early as 1543, the description of a classical language was alien to the medieval master masons of Tudor England, who were left to imagine how one should use the orders and what the original buildings of ancient Rome were like. Travelling masons and sculptors such as the French sculptor Alan Maynard collaborated with Robert Smythson to remodel Longleat in the 1570s. This was a quirky hybrid that set the trend for the English Prodigy House, a uniquely English understanding of the Roman villa. Architects such as Symthson, Robert Stickelles and John Thorpe designed tall, often classically ornamented buildings with porches and loggias taken from the 16th century pattern books such as J A Du Cerceau's Petites Habitations c 1560. It wasn't until Sebastiano Serlio's work 'The Five Books of Architecture' (also known as the Seven Books) was translated into English, and published in 1611, that the Renaissance fire was truly lit in England, and the inspired the young talented Inigo Jones to carry the torch. Palladio's villas and public buildings had a profound effect upon the travelling British aristocracy. Lord Arundel and his party, including the architect Inigo Jones, visited Italy during 1613-14. Inigo Jones is regarded as the first of the English Palladian Architects, The Queen's House c1616 in Greenwich, being the archetype of the English Palladian style which set the model for the English country house.





Above: FIG A.1

Left: FIG A.2

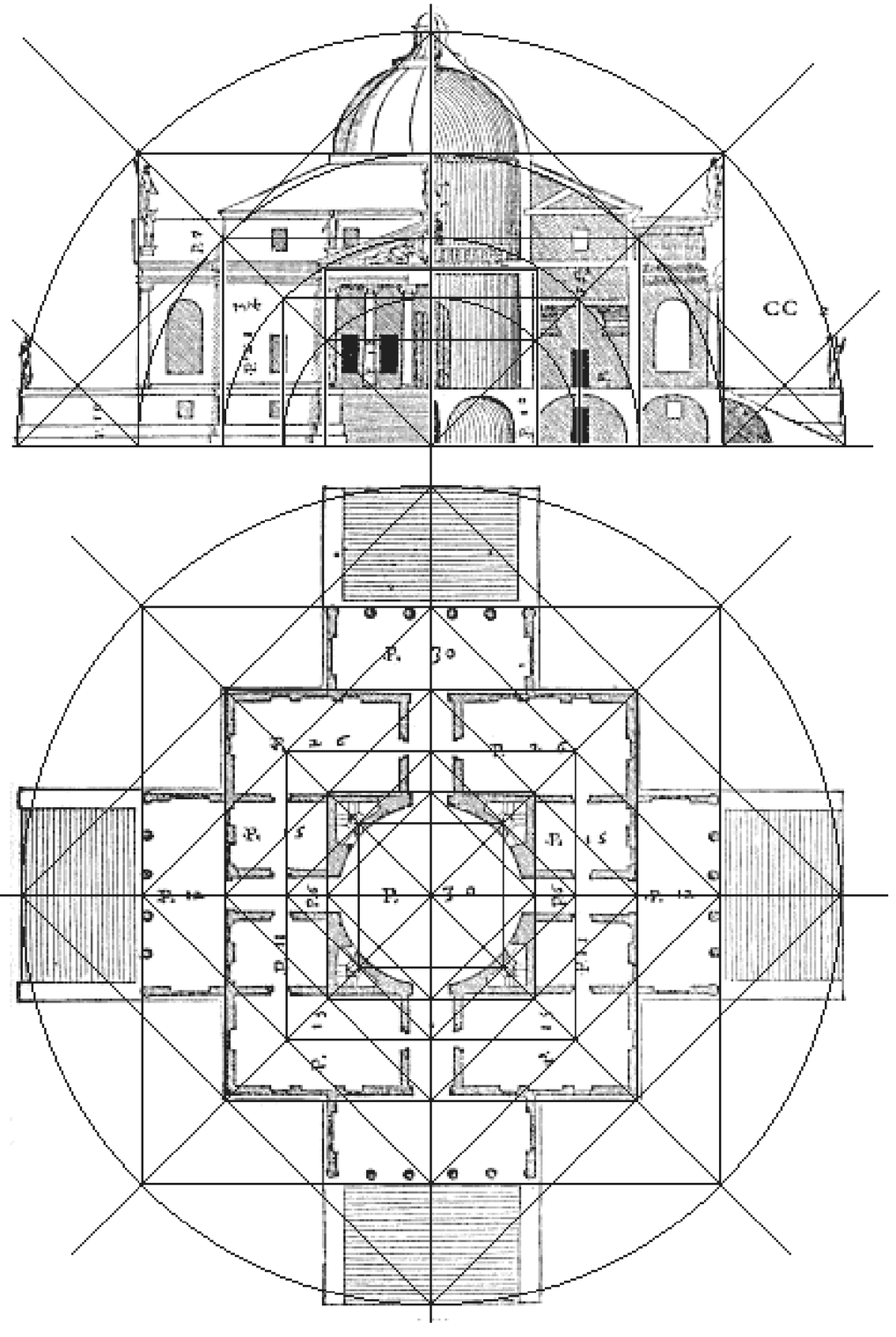


FIG B

5. At the time of the first English edition of Palladio's 'Four Books of Architecture,' Colen Campbell's 'Vitruvius Britannicus' was published in three volumes 1715, 1717 and 1725. It included the works of Inigo Jones, Christopher Wren, James Gibbs and Colen Campbell. The work introduced Colen Campbell to wider a client base with the subsequent editions containing Campbell's major commissions at Stourhead (1724), Wanstead (1720), Mereworth Castle (1725), Houghton Hall (1722) and Burlington House (1717) where Lord Burlington sacked James Gibbs and appointed Colen Campbell. Lord Burlington, Colen Campbell and William Kent are generally regarded as the founders of the English Country House tradition. Burlington's Chiswick House (Chiswick Villa see FIG C) and Colen Campbell's Mereworth Castle were both modelled on Palladio's Villa Rotonda. These villas, along with Campbell's designs for Wanstead and Stourhead and Burlington and Kent's Holkham Hall, were instrumental in influencing architects, and their patrons, into commissioning great houses for what became known as Palladian (after Palladio) Architecture.

6. Lord Burlington was one a coterie of aristocratic architects and Freemasons, who revelled in the purity and order the Vitruvian principles of Durability (strength and firmness), Utility (useful throughout the ages), and Beauty (to beautify, delightful conditions) and believed it important that architecture should reflect these principles. As a Freemason, the more intellectual and arcane nature of the geometric proportions contained within Vitruvian man appealed to the intellectual spirit of Burlington, and were part of the masonic initiation and levels of masonic degrees. The masonic greeting 'are you on the square' is derived from this diagram of squaring the circle. The masonic symbol of the angle represents the square, the symbol of earth and the material world. The square in masonic terms represents fairness, balance, and firmness -very close to the Vitruvian attributes. Squaring the circle is a diagram that goes back to the early foundation of the pyramids in Egypt. The pyramid is drawn from the vertical centre of the circumference with its base formed by the diameter of the circle. The pyramid formed (also forms the angle of the masonic compass) provides the sides of the square, the four corners determined through the centre of the circle. This diagram was closest the ancients had to a geometry that demonstrated achieving the impossible, that is of generating a square of the same area as the circle. This diagram is also used for another more arcane demonstration of proportional geometry. The circle drawn from the centre of the tip of the pyramid, whose radius is to the top of the square, therefore forms a circle that is the same ratio to the larger circle as the moon is to the Earth. This diagram can be repeated to show the 'moon' circle to all four points of the axis; north, west, south and east. This diagram appears in many cultures and religious texts and is perhaps most recognisable as part of Tantric Yantra.

7. For Freemasons seeking to talk freely and exchange ideas, without the fear of recrimination, architecture was a means of expressing such knowledge in geometric form. This form of expression goes back to the earliest symbology, in the setting out of stone circles, burial sites, the pyramids, Greek temples though to the medieval cathedrals. The Vitruvian principles held by master masons (see Cesariano's illustration of Milan Cathedral FIG D) and the Abbots of the monasteries kept this arcane knowledge alive. Many religious hierarchies have or had their own sacred geometry, that has defined the building's form and dimensions.

8. The geometry of the renaissance villa and later the Palladian House started off as a mathematical exercise and later to echo the Vitruvian attributes when the inclusion of an arcane proportion system seemed less important. What is significant in the English Palladian tradition is that the 'English Gentleman' took a great interest in architecture and how the building should be laid out and elevated; the building's geometry and proportion being of the upmost importance. Before this it was the master masons or architects that drove the geometry of the building, such as architects like Robert Smythson or John Thorpe. They used the fashionable compact lodge form to express Vitruvian geometry. It was rare that clients were expressly involved in design of platts (plan), such as Sir Thomas Tresham's Triangular Lodge (see FIG E); in this case it was a building designed to 'hide' Catholic symbolism at a time when Tresham thought that his religion might be obliterated forever. Freemasonry became a forum for free expression, with a set of rules in which to communicate, which must have been a great releief for an enlightened audience seeking advancement and knowledge. As such 18th century Freemasonry became fashionable where the demonstration of architectural prowess became a means of communication to your peers that you were an educated and sophisticated Gentleman.

9. The setting out of the Palladian Country house relies on a series of geometrical forms, at the core of the design is the platt or plan of the house. In the early 18th century it was paramount that the setting out of the houses reflected a purist geometry derived from such diagrams as the Vitruvian man, the squaring the circle. Most patrons would have had a 'classical education' to some level, certainly enough to understand the importance of geometry and number to such ancient philosophers as Plato. Plato considered geometry and number as the most reduced and essential, and therefore ideal, philosophical language.

"And do you not know that they (the geometers) make use of the visible forms and talk about them, though they are not of them but of those things of which they are a likeness, pursuing their inquiry for the sake of the square as such and the diagonal as such, and not for the sake of the image of it which they draw? And so on in all cases… What they really seek is to get sight of those realities which can be seen only by the mind" - PLATO, Republic. VII. 510 d, e.

The Platonist sees geometrical knowledge as being innate within us, having been acquired before birth; an 'a priori' (from what is earlier) truth, when our souls were in contact with the realm of the ideal being - as such the 18th century architect, equipped with square, a compass, a worn copy of Euclid Elements and Palladio's 'Four Books on Architecture,' had all what was needed to create the great work.

The setting out the plan, as stated earlier, would have been a purist exercise in geometry in the early 18th century. The elite group of architects revelling in the newly learned arts of the classical language. The platts of buildings such as the Villa Rotonda had more in common with religious buildings, due to the simple cross form based upon 'squaring the circle.' The revolution in demand for a Palladian Palace or a small Georgian country house created a plethora of architectural guides or pattern books such as Batty Langley's 'The Builder's Jewel' pub. 1743. Architects worked for great patrons but the truth is that most gentlemen clients had to seek varying skills of surveyors or builders using the pattern books, and architectural guides (Such as Robert Morris and William Halfpenny) setting out 'rules of thumb' providing a proportion system of room sizes and column spacings, to paste together a building platt; and hence the word pastiche (derived from the Italian pasticcio referring to pie containing a mix of ingredients). Such designs were often well proportioned because the rules followed were based upon the geometry of classical proportion, but it is unlikely that the designers were aware of the geometry behind their designs.

Whilst Burlington's Chiswick House was widely admired for its design and William Kent's interiors, the general view of the cognoscenti was that it was too small to live in, 'with no rooms large enough to entertain'. As such, many country house layouts in the later 18th century departed from the rigidly square geometrical plan forms although symmetry still dominated the plan forms up until the early nineteenth century. The influence of Humphry Repton was considerable. He was instrumental in changing the design of principal reception rooms bringing the living accommodation down from the 'Piano Nobile' (the Noble first floor) to ground floor allowing access to the garden. As such the orientation of the design changed to allow the layout to best capture views and daylight. Loggias were re-introduced to allow a transition from the house to the garden (as per his design at Sheringham) and also introduce a more informal or asymmetric design adopted. As such, the need for symmetry was consequently abandoned although the principal elevations were still set out to traditional proportions - as has the design for Woodfold Villa which is derived from this period of a historical design.

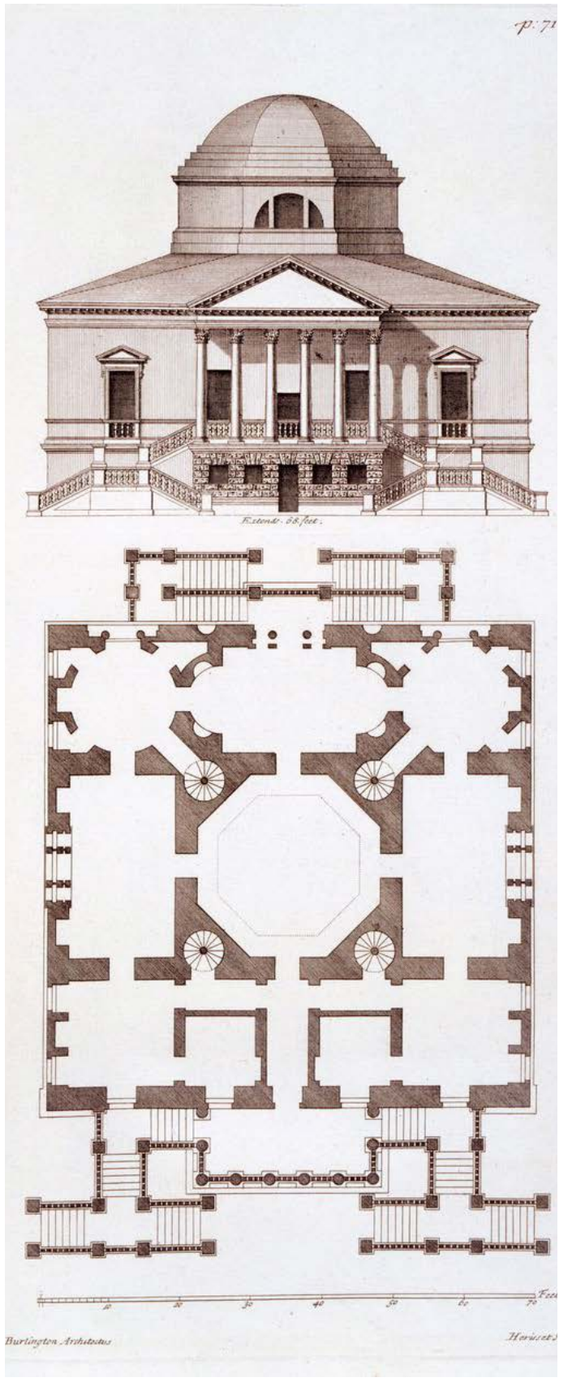


FIG C

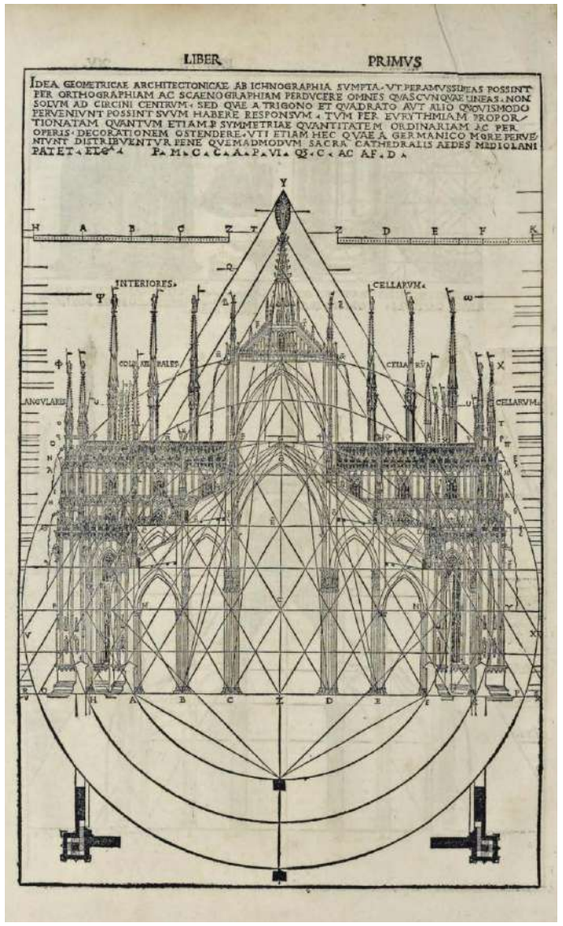


FIG D

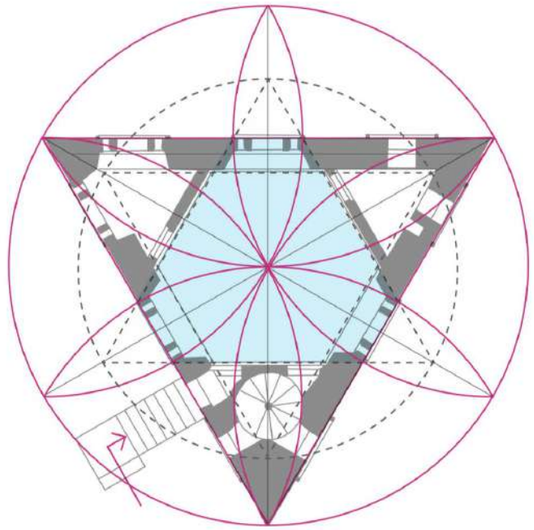


FIG E.1

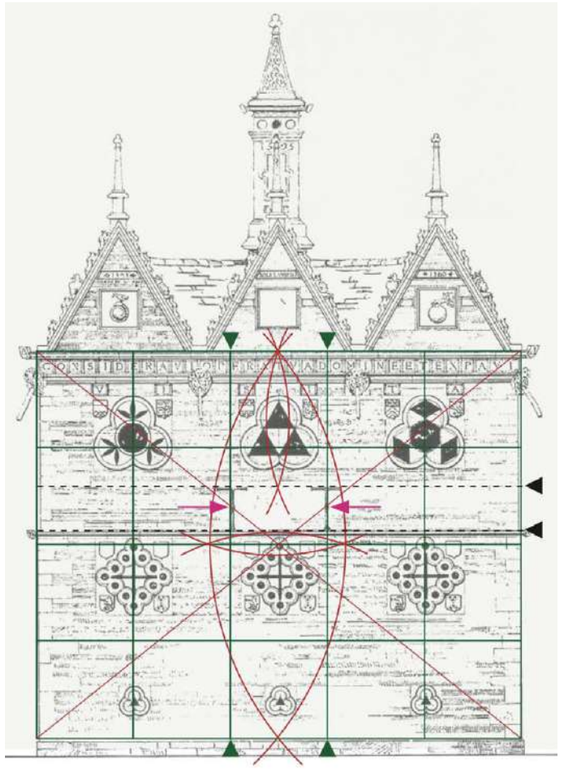


FIG E.2

The Methodologies of Geometry

As stated above much of the classical language of architecture was learned through using proportion systems and pattern books. Cesariano 1521 and Serlio 1551 in their 'updating' of Vitruvius's De Architectura, provided detailed drawings, analysis of Vitruvius's narrative and an explanation of the Vitruvian grid. What these pattern books did not provide, in general, was how these forms were derived, set out and proportioned. The key attribute of Vitruvian design philosophy was the use of a grid, a system known by Aristotle as a 'Taxis' formed of two levels: the schemata (the grid) and the tripartition (splitting in three parts). The Vitruvian grid was split into modules (Latin Modulus, a measure) which Vitruvius called his 'Idéae', based upon the diameter of the column base, to establish a proportion system for each order. For each order the height and spacing of the columns is set out as a 'rule of thumb', each module was subdivided into six parts to proportion the detail of the orders, this was later subdivided by the Renaissance architects into thirty parts to obtain a level of accuracy not though necessary by Vitruvius and his Roman contemporaries.

The following methodologies of Geometries, to establish proportion, have been used since the foundation of the first pyramids; this geometry was formalised by the Ancient Greeks. Each method for setting out the geometry generates the proportions used in classical design and architecture. The different methods of geometry are used to establish principal proportions and setting out. The overlay of different geometries allows for a unique building 'grid' to be established to determine the heights of windows and doorways. The use of geometries overlaid allows the generation of lines and specific angles such as the angle of the great pyramid (51 degrees 51 minutes) and Phi (the angle formed by the golden section). These generated angles and lines are called 'a germination.' Architects have used the germination of lines and angles from the Vitruvian man or used the Vitruvian grid in order to design a Palladian style villa since the 16th century. The methods listed below are how architects, priests, masons and surveyors set out their buildings and often using a combination of the various methodologies.

Geometry means 'measure of the earth'

The geometry and proportion systems used in setting out were a composite overlay of the vesica, squaring the circle, the canon (Pythagorean numbers), the golden section, and the Pyramid squaring the Circle and Rabatment (the rule of three). All of these geometries are combined in the diagram of the Vitruvian ideal, shown in Leonardo de Vinci's Vitruvian man. FIG 1

The Vesica Piscis: The Mandrola; the renewing of life

The Vesica Piscis, in the Christian geometrical canon, is a representation of Christ; as the conscious human form (i.e. now) balancing out the eternal (heaven) and ephemeral (earth). The Piscis means the 'bladder of the fish.' The Greeks and Romans believed the Vesica Piscis was a token of fecundity, of renewal of life; Venus arising reborn from the waves. In Christian symbolism it is that of Christ reborn. The Vesica is the starting point to proving a series of geometrical exercises that are staging points to the golden section, first establishing the geometrical proof of 'the root of 3' (by a rectangle formed within the vesica) and followed by 'the root of 5' (the angle forming the root of 5 establishes part of the geometry of Phi, the golden mean). The use of these diagrams helps establish the basic construction lines to enable drawing the proportions of the portico. FIG 2, 3, 4, 5 & 6

Squaring the Circle: The marriage of heaven and earth

The circle is the shape traditionally assigned to the Heavens, and the Square to the Earth. When these two shapes are unified by being made equal in area or perimeter we speak of 'squaring the circle', meaning that Heaven and Earth, or Spirit and Matter, are symbolically combined or married. This symbolic marriage is illustrated by the small circle fitting above the Vitruvian man's head between the large circle and the square. The proportions of the small circle to the large circle of that of the Moon to the Earth (this can be more easily achieved using the method of the pyramid squaring the circle) in a simple ratio the circles are at a ratio of 3:11

The Marriage of Heaven and Earth is often symbolised by a rainbow. The diagram of squaring the circle, can be used to show the rainbow as a representation of this proportionally, the outer circle of the rainbow forms the outer circle and the inner circumference of the rainbow, that formed by a circle within the square. FIG 7 & 8

The Canon: The numbers of Heaven and Earth (Pythagorean numbers)

The squaring of the circle in the ratio of 3:11 is symbolised or represented in many church layouts or doors. The sun takes 33 years (3 x 11) for a perfect repeat sunrise on the horizon. Jesus dies and is resurrected aged 33. Ramadan occurs every 12 moons and takes 33 years to move around the calendar. The Canon is a whole numerical system based upon symbolism number and measure. This is best illustrated by the use of representational numbers for length and width. This was used to set out churches using the Latin or Greek name for the saint, ascribing a value to the name (the 'Logos Opticos' : The logic of composition) , made up from the numerical value from the Greek or Hebrew alphabet. Known as Grematria, the numerical system developed by practitioners of the Kabbalah and derived from the Ancient Egyptians and Greeks.

These proportions are at the root of classical (classici; the highest ranks of the social order of ancient Rome, proletarii being the lowest) architecture. These proportions define essence of the 'Logos', in ancient Greece 'the word'. This is a canonical system where the ancient Greek word for a God defines length and sets a series of proportional reaaltionships. 'Logos', translates from the ancient Greek also means "reason" and "thought". 'The Logos', in ancient Greek philosophy and early Christian theology, established the divine reason implicit in the cosmos, ordering it and giving it form and meaning (The Encyclopaedia Britannica) . The Logos is the meaning inherent in a place, for the Ancient Greeks it was at the heart of the Temenos, a holy sanctuary or temple precinct.

Underpinning this canonical structure are the series of whole numbers. Half way between 3 and 11 is 7, where 11/7 is the ancient Egyptian value for half of pi, so a circle radius r has a quadrant arc 11/7 r. The Sand Reckoners diagram (Greek: Psammites and Latin ; Arenarius) a work by Archimedes, sets out to discover the number of grains of sand that fit into the universe. By using the diagram, a square's edge may be exactly divided into 3,4,5 and above, 7 and 11 parts. The initial lines produce a series of whole number lengths, areas, and shapes, including a multitude of Pythagorean 3-4-5 triangles of various scales. What is clear from such geometrical relationships is that the geometry of these elements define the key proportions of the portico and established a grid or schema that defines the heights of architectural elements. FIG 9, 10 & 11

The Pyramid Squaring the Circle and Phi

The Great Pyramid of Giza, in Egypt, is probably the most famous structure or geometric object on earth. As one of the of the seven wonders of the World, it has defined human endeavour for millennia. It is therefore not surprising that the geometry of the Pyramid has taken centre stage to all things esoteric, including architectural symbolism. The key facts about the geometry of the Great Pyramid are as follows;

1. The 51.85 degrees slope of the Great Pyramid means the square of its height produces and area equal to each face. Symbolically this is represented as a map of the earth is equal to each face of the pyramid.
2. The Golden Section in the pyramid, Phi = 1.618
3. Pi in the pyramid. Pi defines the ratio between the circle's circumference and its diameter (3.14159…)
4. The Pyramid Squaring the Circle : The Circumference of a circle on height = the perimeter of the pyramid base
5. A Pentagram defining a 'net' for a pyramid : a folded shape

The angle of slope 51.85 degrees (51 degrees, 51 minutes) is a close approximation to 1/7th of a circle, 51.43 degrees. Geometry means 'Measure of the Earth'. The Pyramid functions as an accurate sundial, observatory, surveyors tool and repository for standard weights and measures. Its perimeter is exactly half a minute of equatorial latitude. FIG 12 & 13

Halflings and Thirdlings

An equilateral triangle or two nested squares both achieve the same geometrical objective; the circle within each of these figures is exactly half the size of the surrounding circle. This is a geometrical image of the musical octave, where a string-length or frequency is halved or doubled, a Pythagorean progression. FIG 14, 15, 16 & 17

The Golden Section

A pentagram inside a pentagram is shown in diagram, FIG 13. In the diagram pairs of lines are highlighted. The length of each pair of lines is a golden section ratio, 1: phi where phi can be either 0.618 or 1.618. Phi divides a line so that the ratio of the lesser part to the greater part is the same as the ratio of the greater part to the whole. No other proportion behaves so elegantly around unity. For example 1 divided by 1.618 equals 0.618 and 1.618 x 1.618 equals 2.618. So Phi minus Phi equals one, and Phi x Phi is one plus Phi !

The Golden Section is one of three simple proportions found in early polygons; Square, Pentagram and Hexagon. With edge-lengths of 1, a square produces an internal dimension of the 'root of 2,' a pentagram 1.618 (Phi), and a hexagon 'the root of 3.' Although the 'root 2' and 'root 3' are found widely in nature, Phi appears predominantly in organic life and only rarely in the mineral world. These proportions are employed in good design. Many familiar objects such as credit cards and Georgian front doors are Phi rectangles.

Pythagorean Number progressions such as the Fibonacci series: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144… (adding the last two numbers to get the next) increasingly approximate to Phi.

A golden section rectangle, widely used in architecture, is constructed from the midpoint of the side of the square to the corner of the opposite side. The angle then forms a radius, the resulting arc, to the base of the forms a rectangle with a side to the value of Phi, creating the golden section. This diagram is rotated by 90 degrees with each square formed from the longest side of the previous rectangle. The resulting series of curves forms the iconic 'nautilus shell' shaped form so beloved of mathematicians and architects. The use of the Golden section, in this form, is frequently used to demonstrate how famous buildings such as the Parthenon (FIG F) and the Taj Mahal (FIG G) were designed in accordance with the Golden Mean.

There are still many mathematicians and architects that refuse to accept that this proportion system is anything but a myth. Nikos Salingaros (Mathematician, Polymath and Architectural Theorist according to Wikipedia), who collaborated with the celebrated architect, and theorist, Christopher Alexander, has claimed that "artists and architects have long made extraordinary assertions about a preference for rectangles having the aspect ratio 1.618:1 approximating to the Golden Mean. Such claims are false and are chiefly due to failing to measure things accurately. These embarrassing errors are perpetuated by a kind of cult mysticism."

I have alluded to Mr Salingaros's extensive works, often quoted by architects, as proof that 'the golden mean' is little more than an architectural chimera, because the fundamental basis of his argument or theory is incorrect. Salingaros's ill-informed scepticism is entrenched in the architectural profession, to the extent that the design and understanding of how to put together a classical building has not been taught at architectural schools since WW2. This is sad indictment of our times, as without this knowledge architects are ill-equipped to work on historic buildings (the works to Woodfold Hall are a clear example of the poor understanding of classical language) or to create new buildings within the setting of heritage assets.

Figure H is the image of the Parthenon that Mr Salingaros uses to illustrate his theory, to demonstrate that the Parthenon is not designed to the golden section. Had he the sense to rotate the diagram by 180 degrees (see FIG F) , he would have realised that the golden mean diagram forms the perimeters of the building; establishes the depth of the entablature, the width of the metopes, the width, height and spacings of the columns and the height and width of the pediment and the height and width of the building. The Golden mean sets out all of the construction lines to determine the dimensions necessary to form the proportions of the temple. This is an illustration that the geometry of a building should be generated as the framework of a design and not applied afterwards, especially if upside down.

As architects frequently use the Golden Mean or Ratio diagram to demonstrate that their design corresponds with the golden section (even if it is a steel porch or garden patio) I have shown the diagram on the design for Woodfold Villa (see FIG J & K). In Georgian architecture the golden section was used more frequently as an elementary rectilinear form to break up facades, rather than the golden mean diagram to determine the parameters of a great country house. FIG 4, 5, 7, 12 & 13

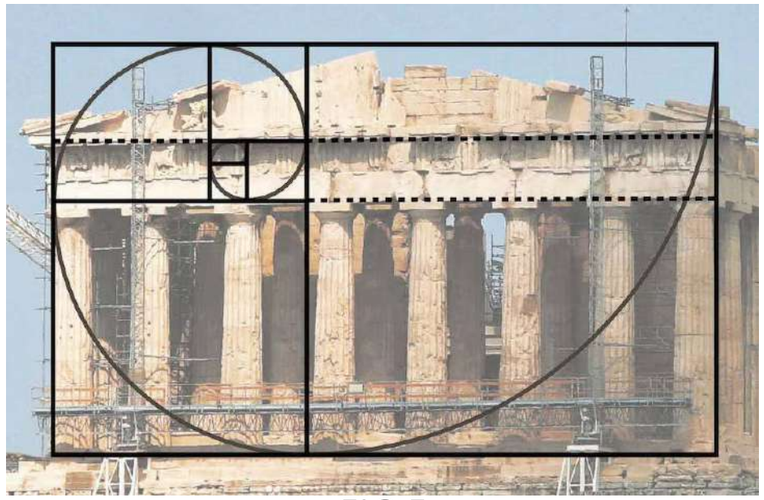


FIG F

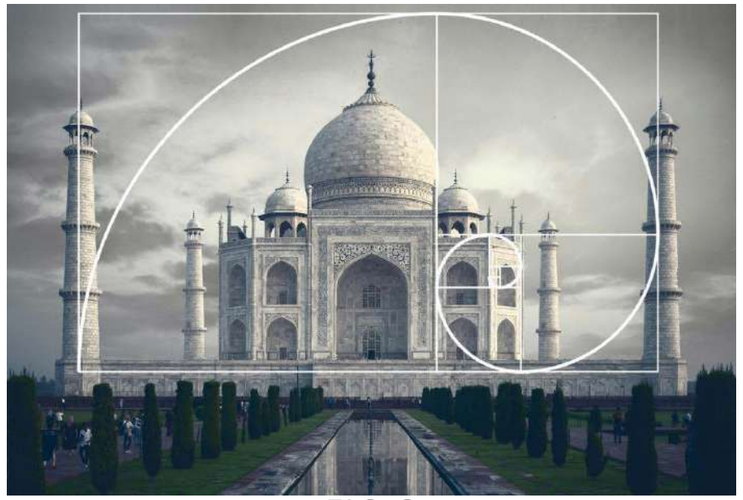


FIG G

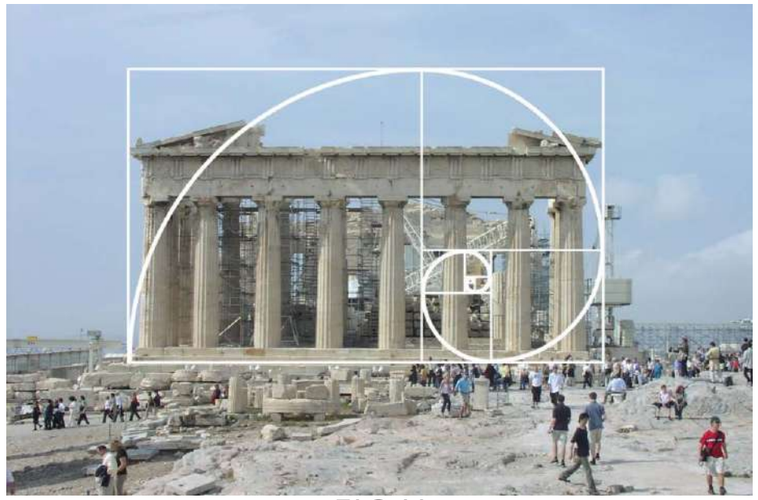


FIG H

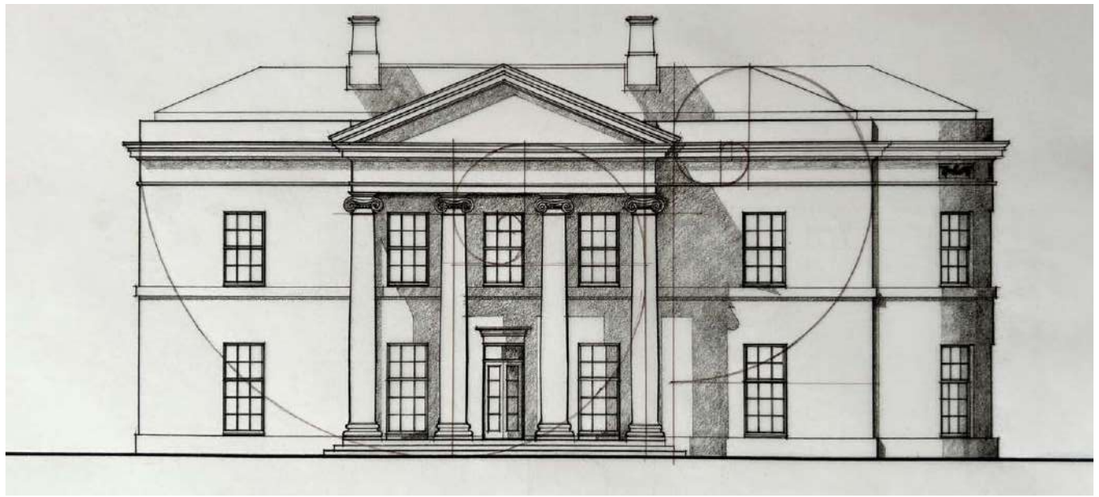


FIG J

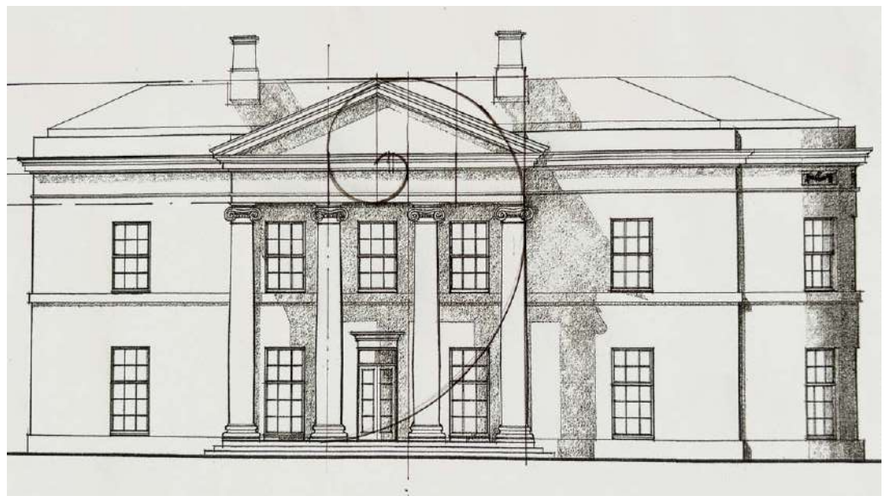


FIG K

The Pentagram

The methodology of constructing a Pentagram is taken from the Almagest (a mathematical and astronomical treatise) of Ptolemy c150 AD. The pentagram is formed within a circle. The circle in the case of designing the porch defines the height of the pediment from the column base. If a line is drawn connecting the top two corners of the pentagram, this line then forms the base of the entablature. In constructing the pentagram the vertical and horizontal axis are used to constructed the form with a series of arcs. The axis are used to form vesica's within the circle. The vertical lines drawn from the intersection of the vesica forms the midpoint of the column bays to set out the fenestration. FIG 5, 12, 13 & 18

Rabatment

Artists traditionally often used the 'the rule of three' to give balance to their paintings. This approach to setting out the design of a piece is most likely to have originated from the iconography of triptychs in representations of Christ or Mary attended by saints and local dignitaries. The 'rule of three ' was part of Aristotle's 'Taxis' called the tripartition. Greek architecture (and to a lesser extent Roman), depended less on pure symmetry; Temple design was 'all portico.' In Greek architecture, a portico was often set on a key religious path or asymmetrically in a wall or building frontage, the tripartition being the plinth, columns and pediment. The influence of Vitruvius through the Renaissance interpretations of the designs of the ancients, i.e. Pliny's Villa led to a purist symmetry. This was driven by both the religious cannon of design, a priori truths and influence of rationalist philosophy from Plato, through Descartes, Spinoza, Kant and Laugier. As such symmetry represented purity in design, a representation of truth. Therefore the country house, in whatever form, would have a central portico with wings either side. Only in the early 19th century were these design strictures loosened. In painting as architecture, the artist would divide their canvas in three, either as squares or rectangles or a mix of both. A successful building, according to the Modernist architect Mies Van der Rohe, "should have a base, a middle and a top." In the case of a Palladian Country House, this is a plinth, floors (perhaps a Piano Nobile) and a cornice or entablature. As such, the composition is divided into nine rectilinear shapes. In setting out the elevation, the initial spaces have a central square form flanked by two rectangles formed from the angle of the Great Pyramid of Giza. FIG 19

Germination

The architectural term germination (Latin germinationem; "a sprouting forth or budding") comes from the germination of seeds, which grow proportionally to the golden mean. In architecture, germination is used in relation to generating the geometry from the base proportion grid or system ; traditionally called 'Taxis' (the orderly arrangements of parts) from Aristotle's Poetics (bk VII para.35) . Having generated the primary forms, germination is an overlay of complementary angles that form the lines and intersections setting out the entablature, windows and proportions of details. Leonardo's Vitruvian man is set out anthropometrically in "symmetrical" form to create the ideal man. This is taken from the modular measurements of Vitruvius. The germination from the proportions of the Vitruvian man start from squaring the circle through the established geometry to Vitruvius' modules. These modules were based upon the proportion of the human body and Vitruvius' modularisation of the orders. The latter Vitruvius conveniently fails to explain, this is because traditionally columns vary in proportion, in the three orders: Doric, Ionic and Corinthian. The proportions of the columns are based on multiples of the diameter of the column above the column base. Vitruvius called these modules the 'Vitruvian Idéae,' he set temples into a modular grid to enable him to link the modularisation of the ideal man to that of building. This is problematic because the Ancients, the Egyptians, Greeks and Early Romans used columns with various proportions, ranging from the early Doric being seven (column diameters in height) later seven and half to eight. The Ionic are eight and a half to nine and Corinthian are ten diameters. This, therefore, means a design cannot be sensibly generated from the column alone, and the geometry of setting out is paramount. Once the generic proportions have been established the column height is a given and the relative proportion of the orders established.

Aristotle's Taxis: Grids and Pattern Books

Vitruvius established a proportion system based upon a grid (Aristotle's Taxis : 'the orderly arrangement of parts', from Aristotle's Poetics bk. VII para. 35) to enable the architect to place columns according to a proportion system i.e. a rule of thumb. The Taxis divides building into two parts, architectural elements and the division of space (partitions). Taxis contains two sub levels the schemata (the grid) and the tripartition (the subdivision of the composition). The grid schema divides the building through two sets of lines. In the rectangular grid schema, which is the one most commonly used in classical architecture, straight lines meet at right angles. These lines are often equal, cutting the composition into equal parts. Where distances are not equal, then the composition is they alter at regular intervals (FIG L). In both cases the composition is sectioned into parts that vary in a coherent manner (FIG M). Figure L also shows a polar (or generative) grid system. A simple cube might be regarded as the purist schema and runs no risk of compromising taxis. A form pattern, which might be perceived as a little more complex and rich is generated by subdividing the cube into equal mini-cubic parts (see FIG N) or the cube increased to a larger form. This formal taxis or pattern is a means of imposing order and unity set apart from the disordered universe.

This system of rules has been expounded by Architects for centuries, since the publications of the illustrated Vitruvius by Cesariano 1521 and Serlio 1551. The Vitruvian book of rules and systems was distilled further into pattern books with room size guidelines, example layouts and facades. The pattern books show diagrams of setting out the classical orders, FIG O shows the setting out of columns, known as Intercolumniation. One of the pattern books most prolifically utilised by architects and builders was Batty Langley's 'The Builders Jewel' which ran into countless editions and folios and was popular as a cheap small illustrated book, unlike the great folios produced for Palladio. What I wish to convey through this report is that underpinning the architectural guides, the rules of thumb and the pattern books is an ancient geometry that is at core of these guides. The design of Woodfold Villa is derived from first principles using geometric devices spanning millennia. Even today modern classical architects use pattern books and grids. The grid used by Irish Architect Hugh Kavanagh (see FIG P) is developed from the Vitruvian original.

Conclusion

The purpose of this report, as stated, is to set out the ways in which the design of Woodfold Villa has been based upon a mature and detailed understanding of a rich tradition of classical architecture, the proportion systems used and explain their derivation and origin. The design process is based on and reflects a thorough understanding of the traditional methodology of setting out and designing a Palladian Villa or Country House and an appreciation of the evolution of this form. That design process, therefore, shows that the design of Woodfold Villa is an exemplary design, drawing on an extremely rich cultural heritage and tradition, and represents an essay and modern expression of the principles of classical architecture and is anything but a pastiche design. It is intended to reflect long-established and deep-rooted architectural principles that derive from antiquity were rediscovered in the Renaissance and have continued to inform architecture and the highest standards of design into the modern times.

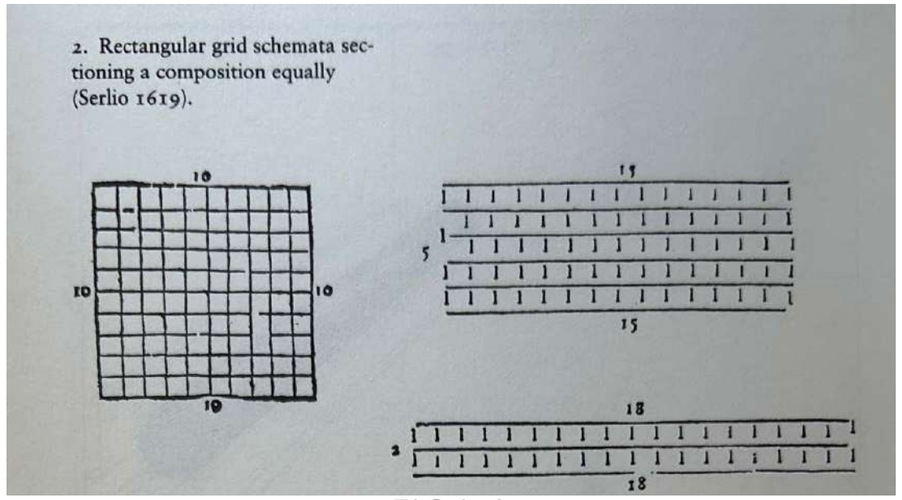


FIG L.1

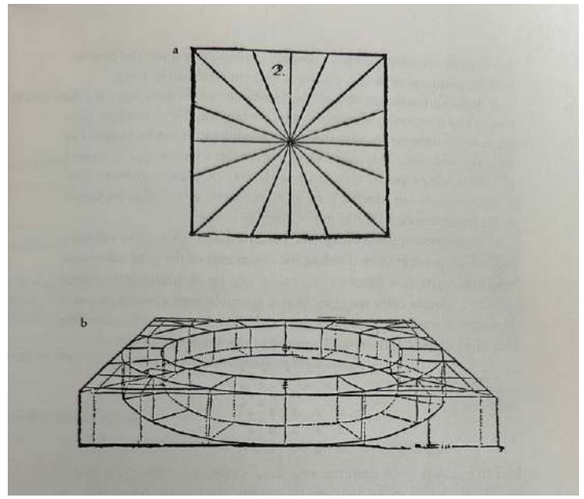


FIG L.2

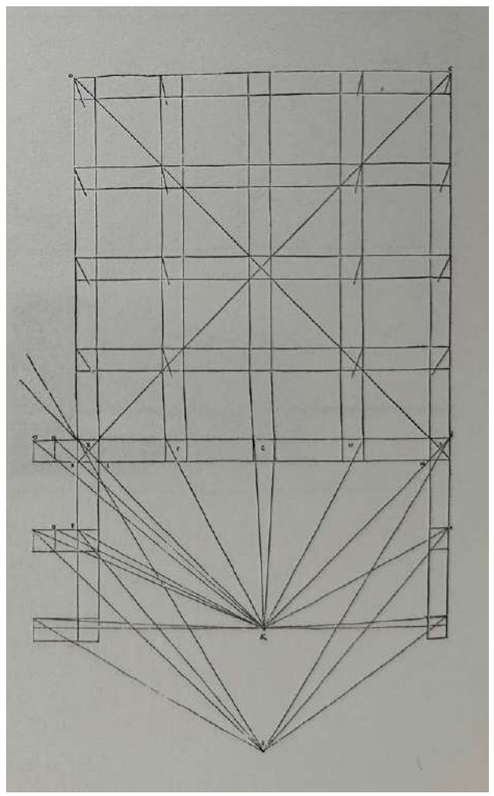


FIG M.1

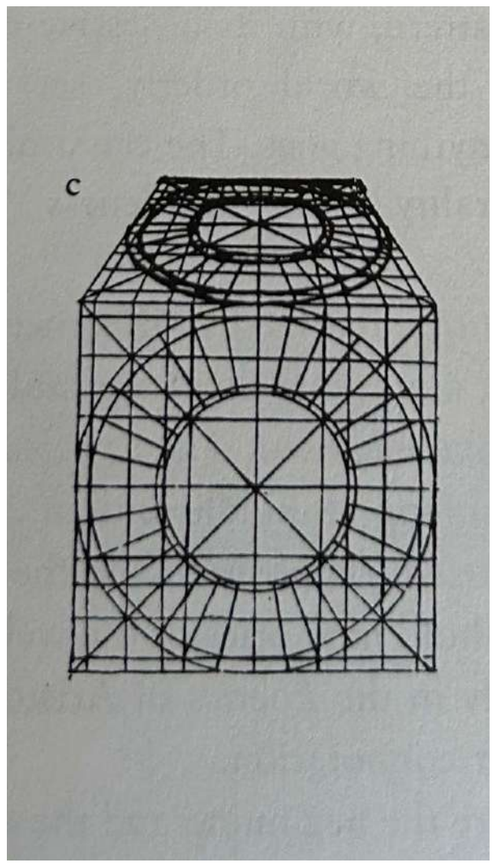


FIG M.2

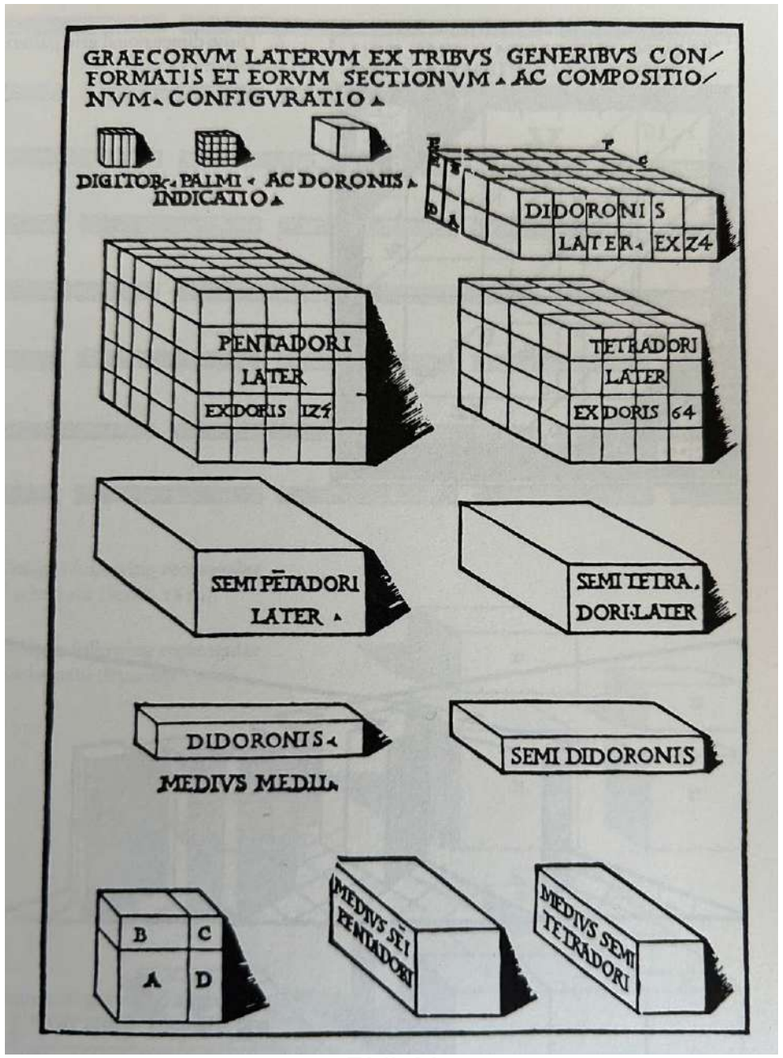


FIG N

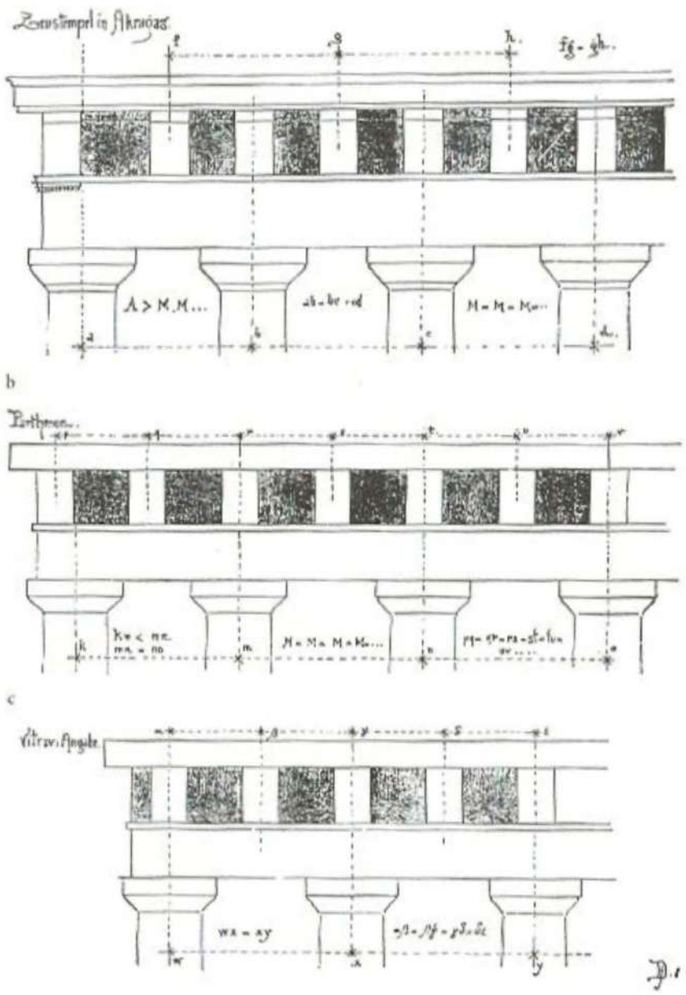


FIG O.1

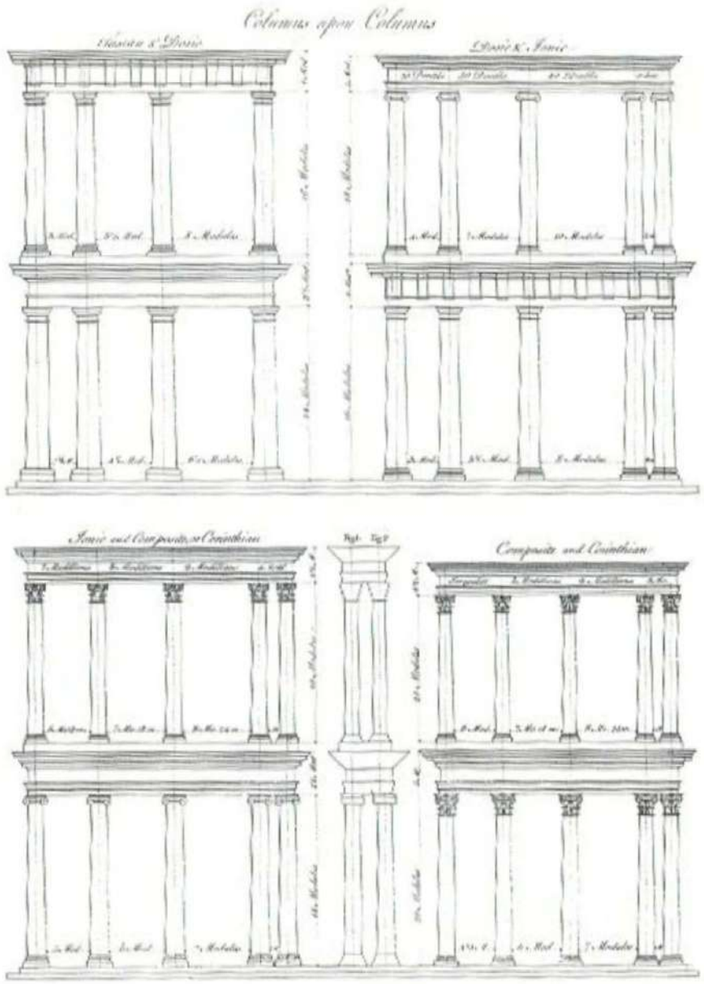


FIG O.2

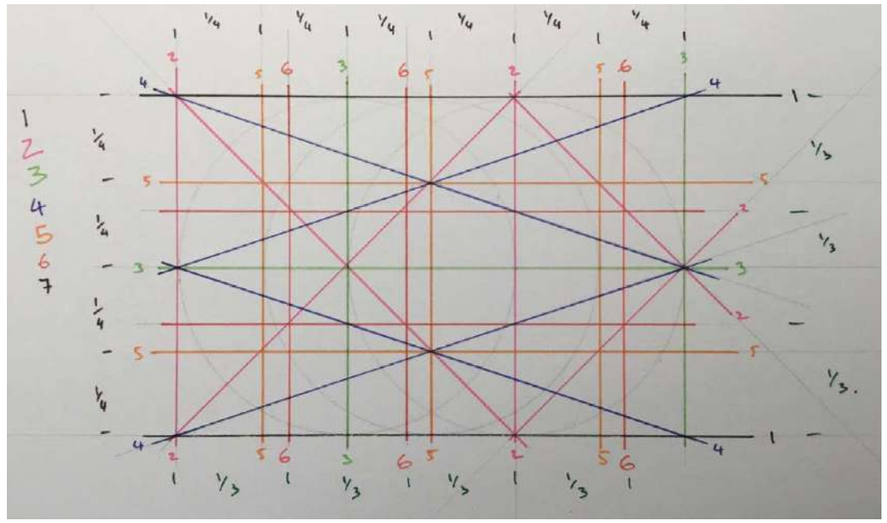
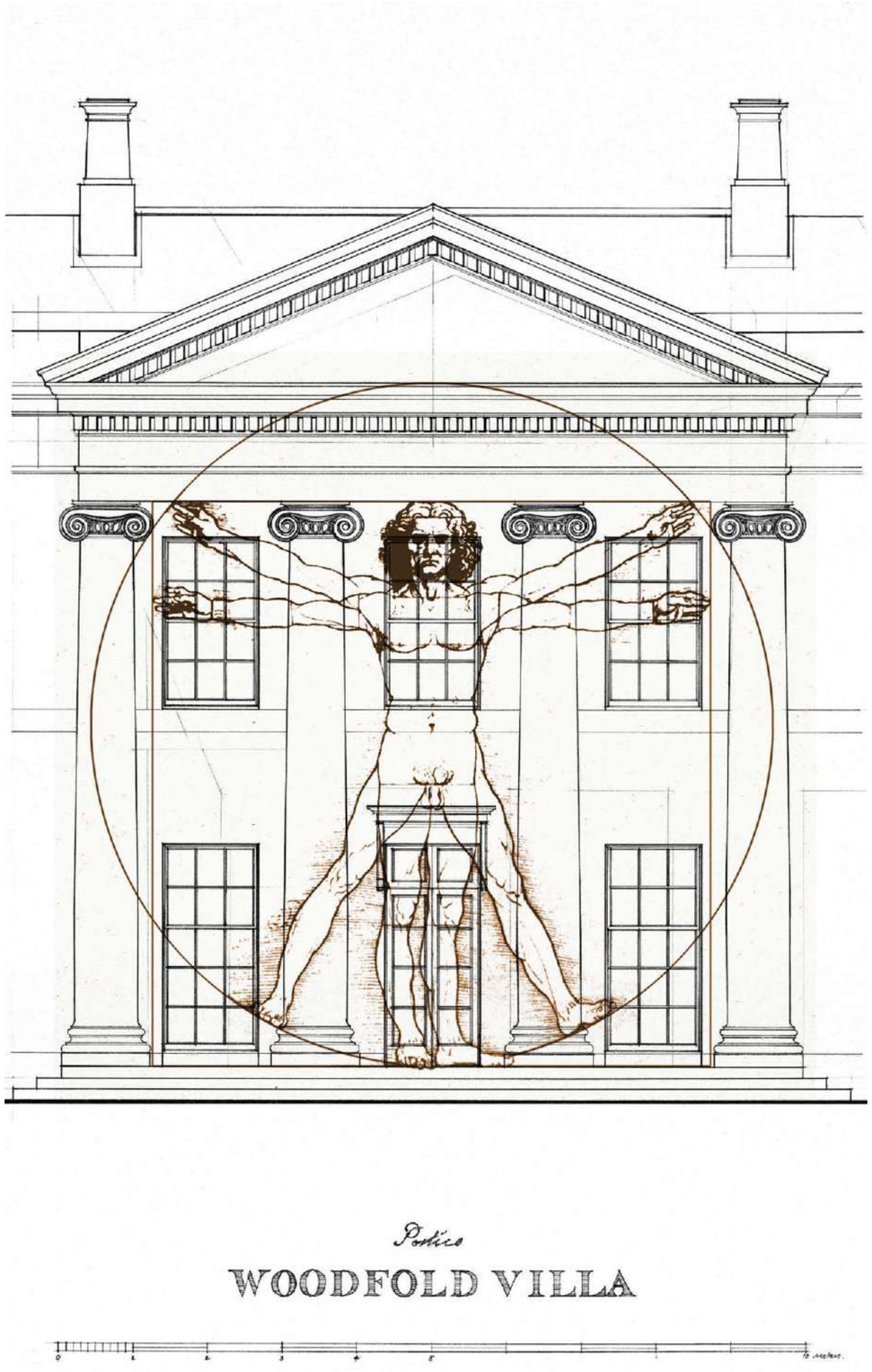


FIG P



The Vitruvian man

Figure 1

The Vesica Piscis: forming the √3 rectangle

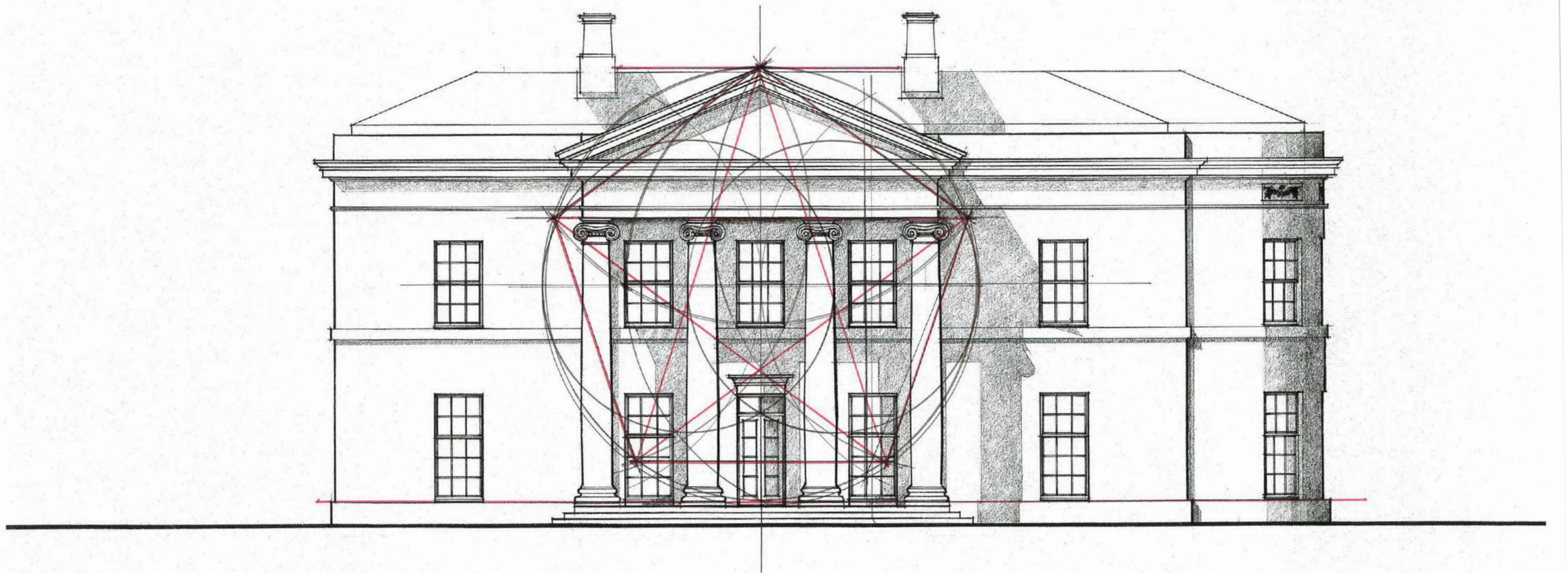
Figure 2

Vesica: rotated

Figure 3

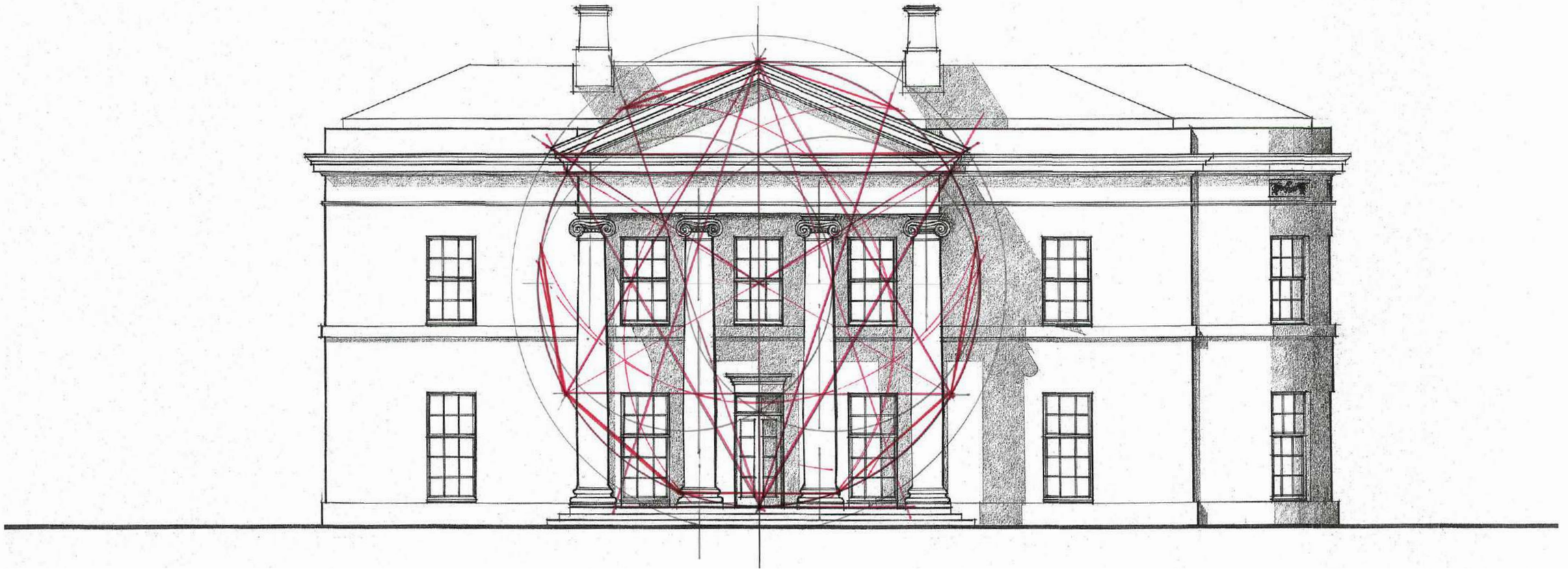
Vesica Piscis to generate the √3 rectangle and the √5 angle

Figure 4



Pentagon & Vesica Piscis

Figure 5

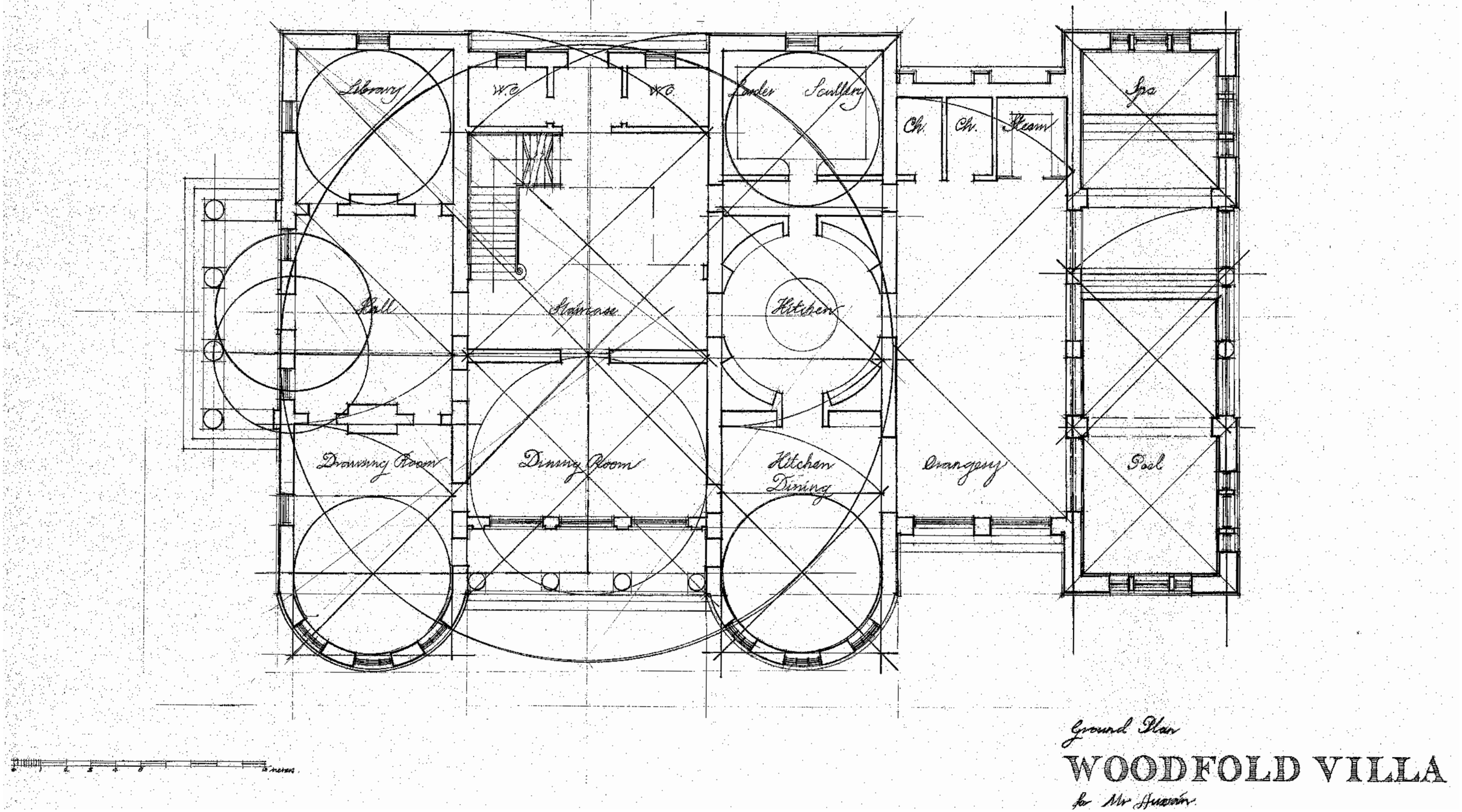


6-sided star (Solomon's seal) and the Vesica Piscis

Figure 6

Squaring the circle and pyramid

Figure 7



Geometry of the plan: Squaring the circle

Figure 8

The Canon: The Sand Reckoners diagram
(within the grids of the portico)

Figure 9

The Sand Reckoners diagram
(the portico square)

Figure 10

Generation of intervals from the hexagon

Figure 11

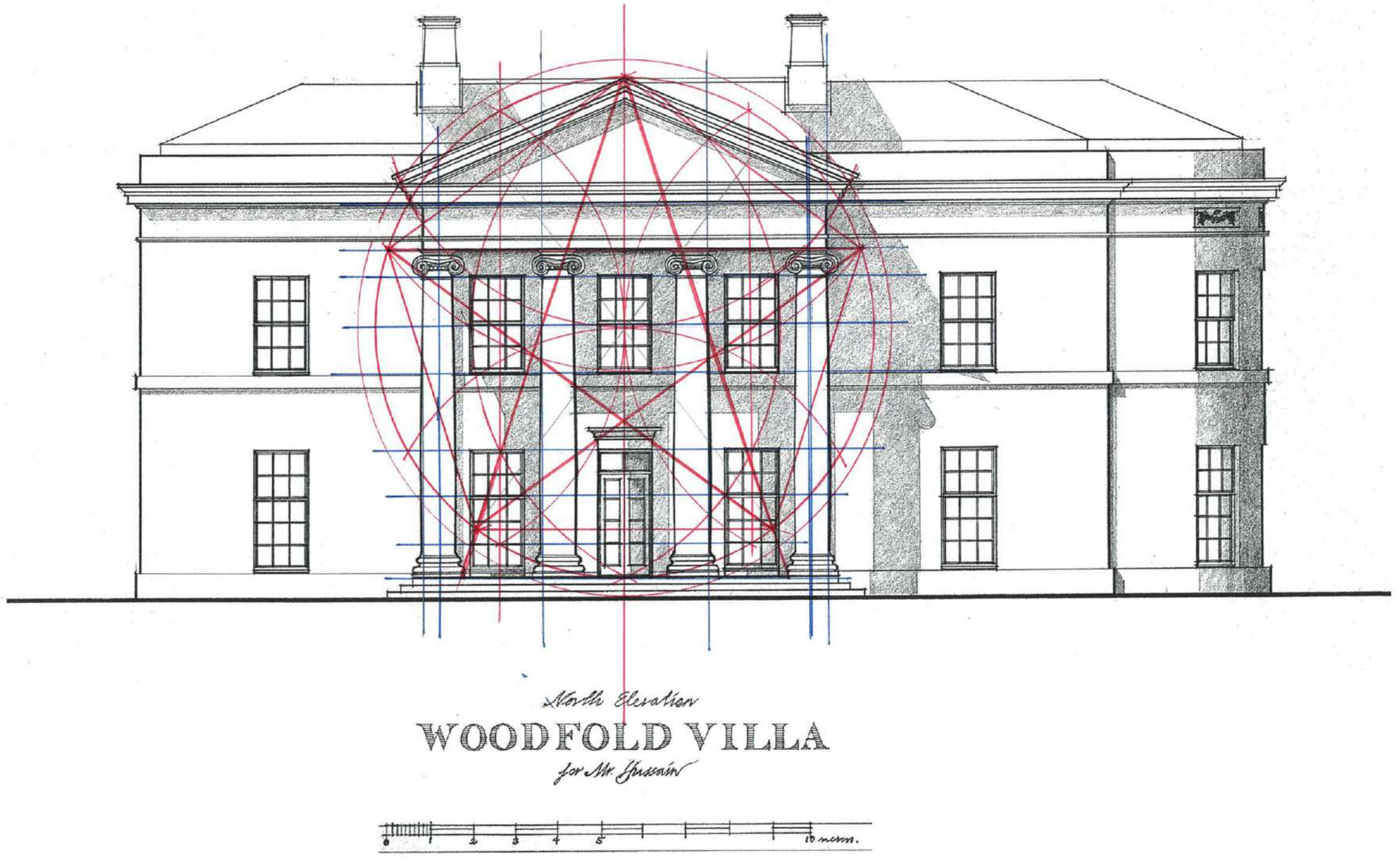
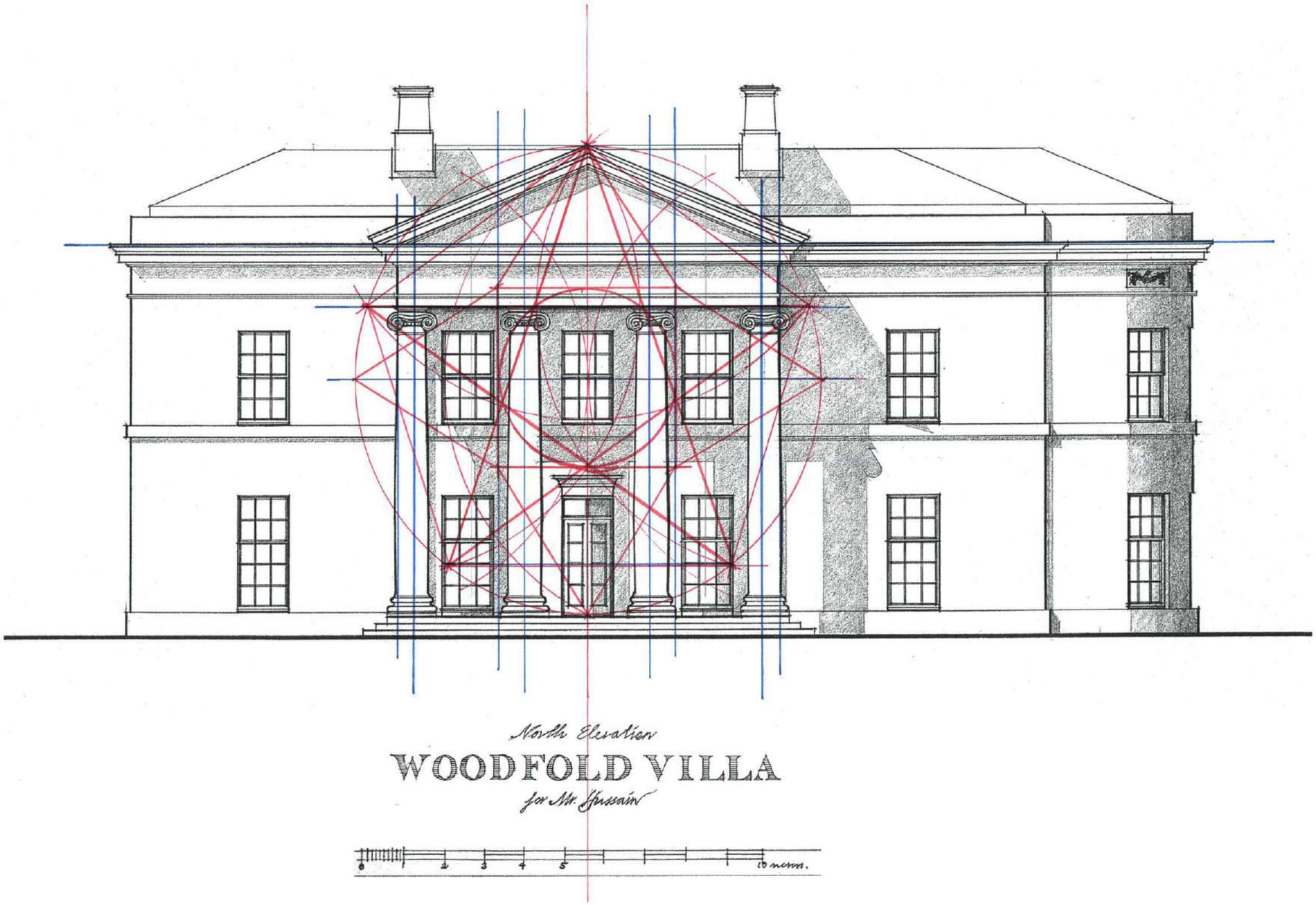


fig 12

The Golden Section. Five star pentagon & four-fold vesica piscis

Figure 12

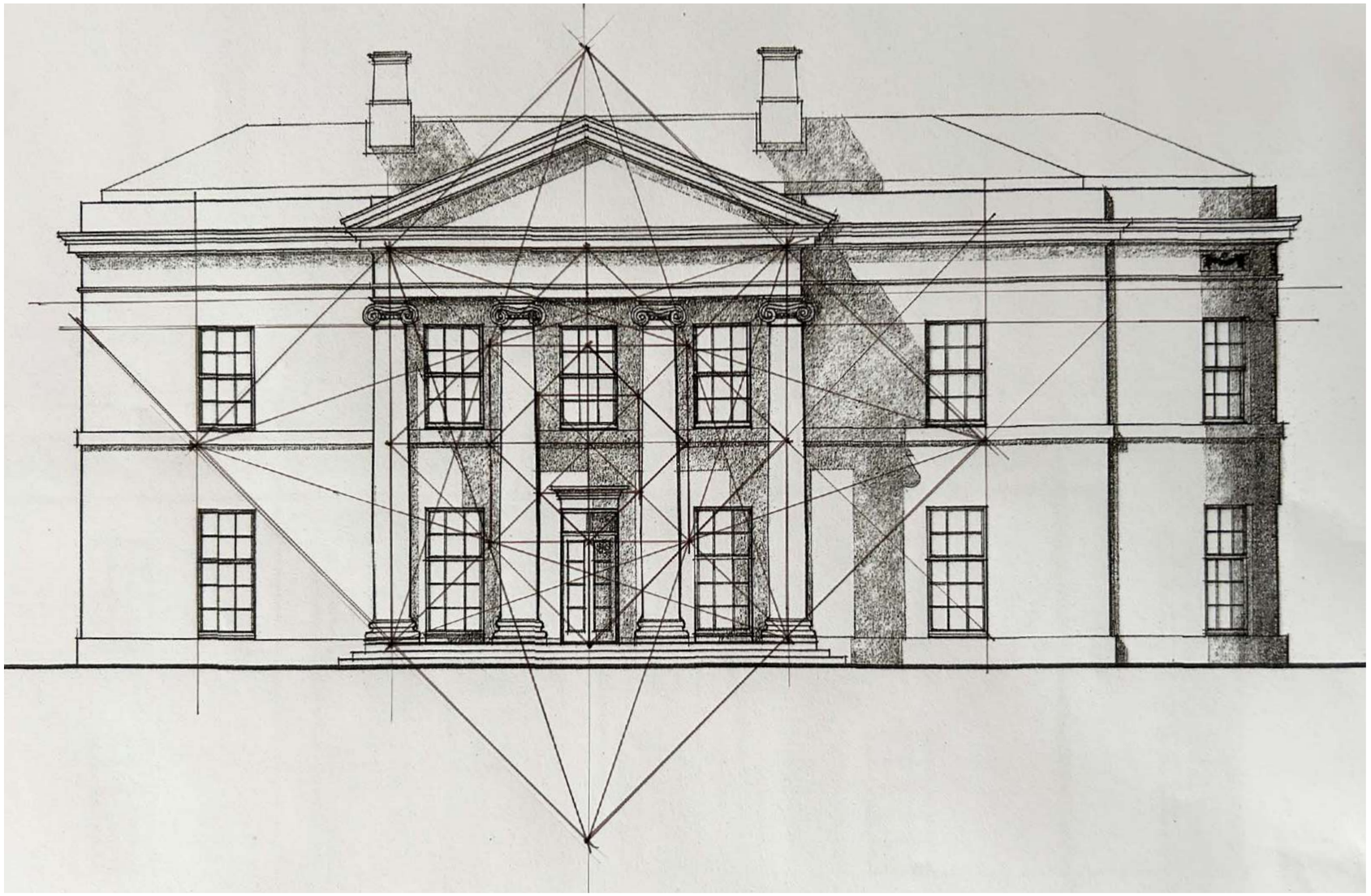


Constructing a pyramid net from a pentagon

Figure 13

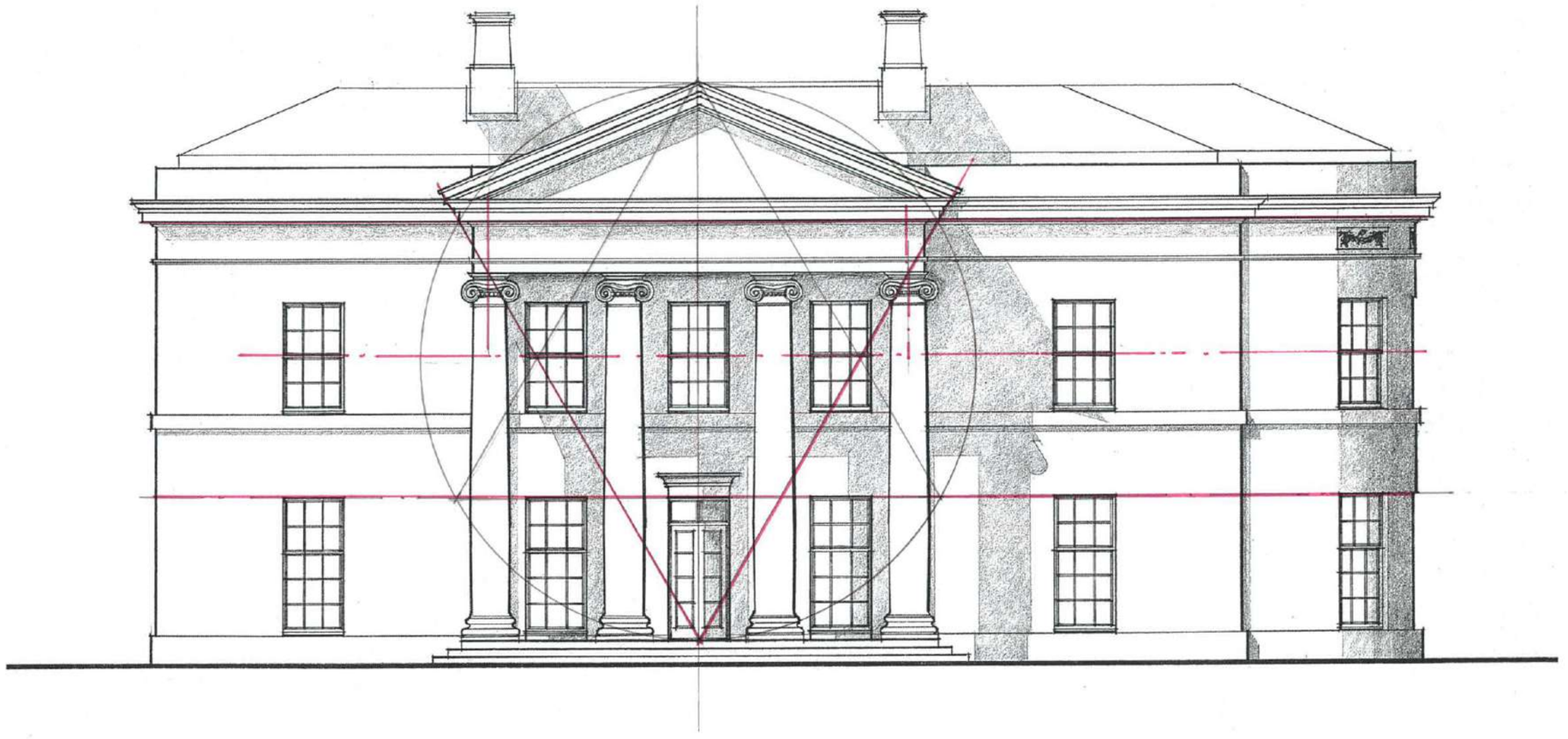
Pythagorean intervals

Figure 14a



Pythagorean intervals

Figure 14b



Six sided star: Soloman's Seal

Figure 15

The geometry of an Ennagon

Figure 16

The geometry of an Ennagon

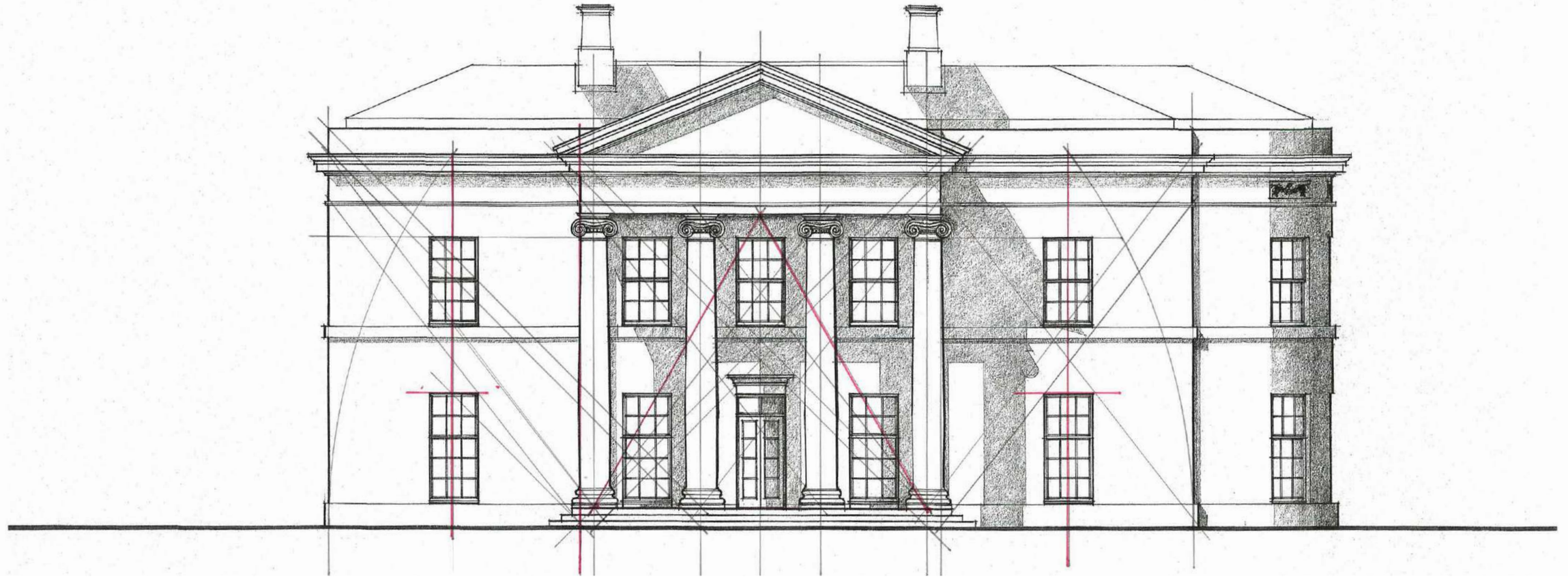
Figure 17

Constructing a pentagram

Figure 18

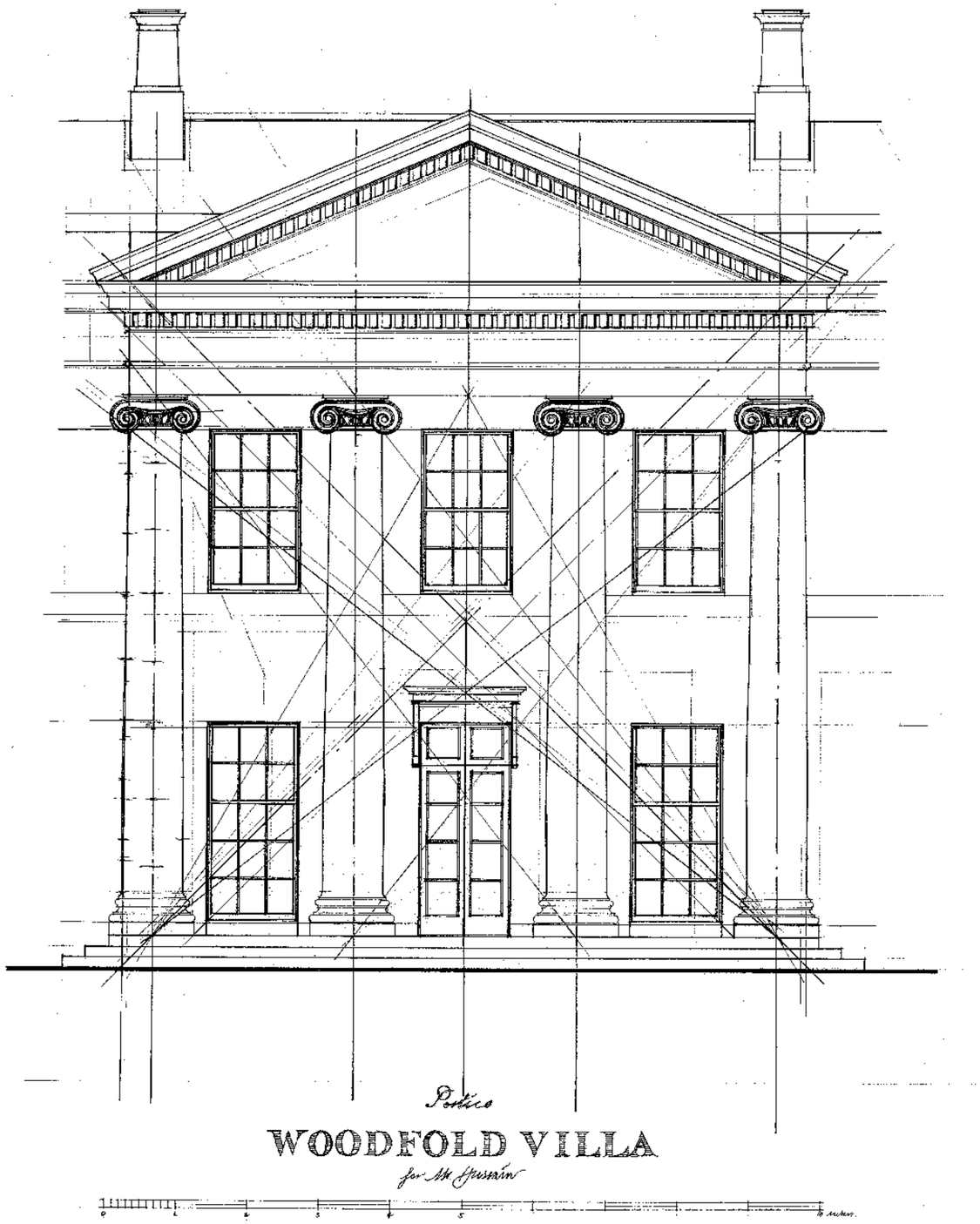
Setting out the parameters

Figure 19

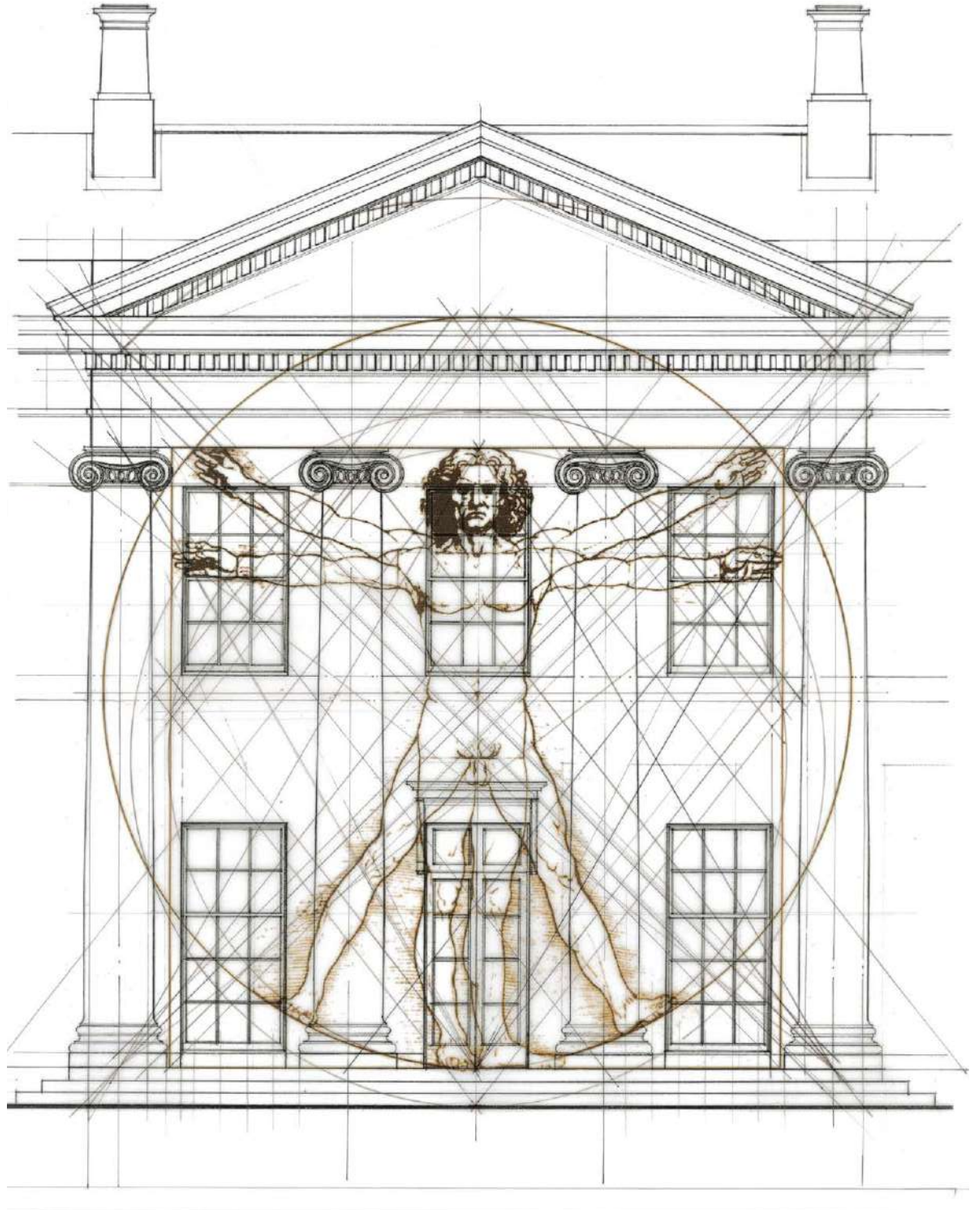


Setting out using the pyramid: 60°, Φ, 45° angles

Figure 20

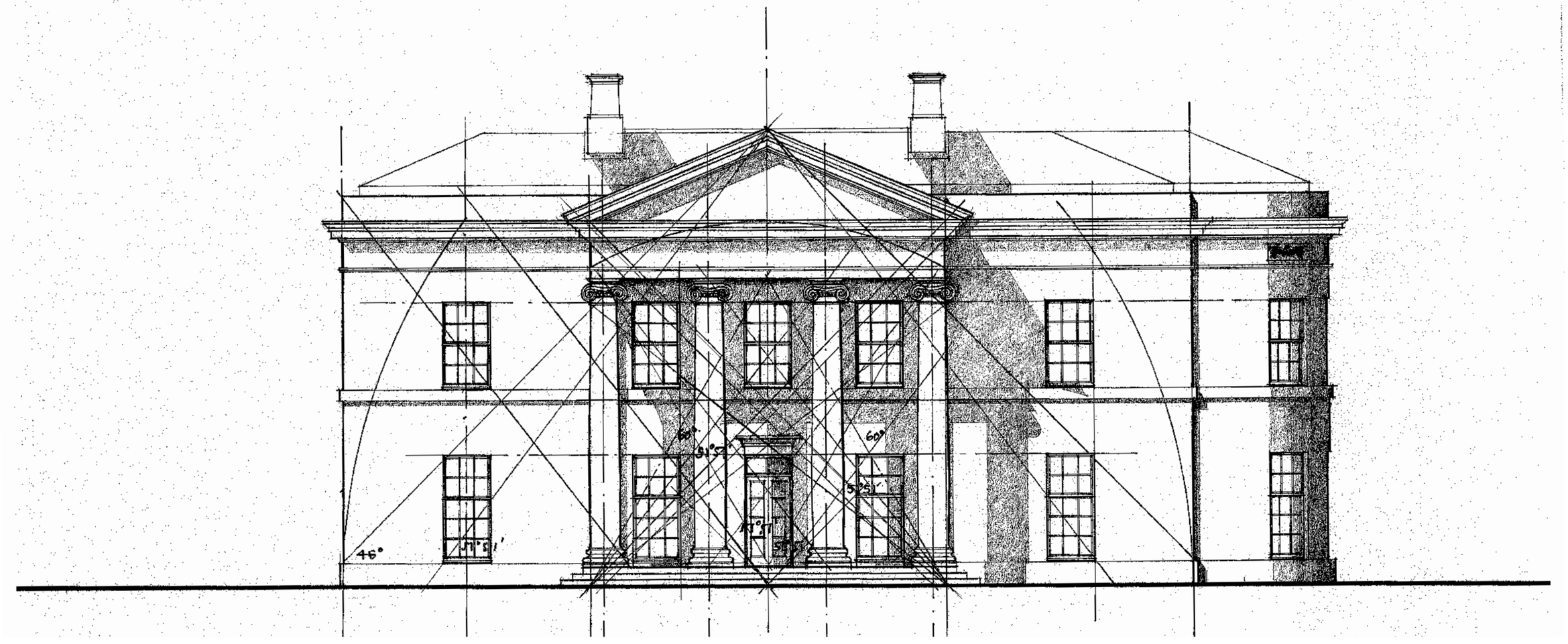


Germination diagram: Φ, the pyramid, 45°, 60°



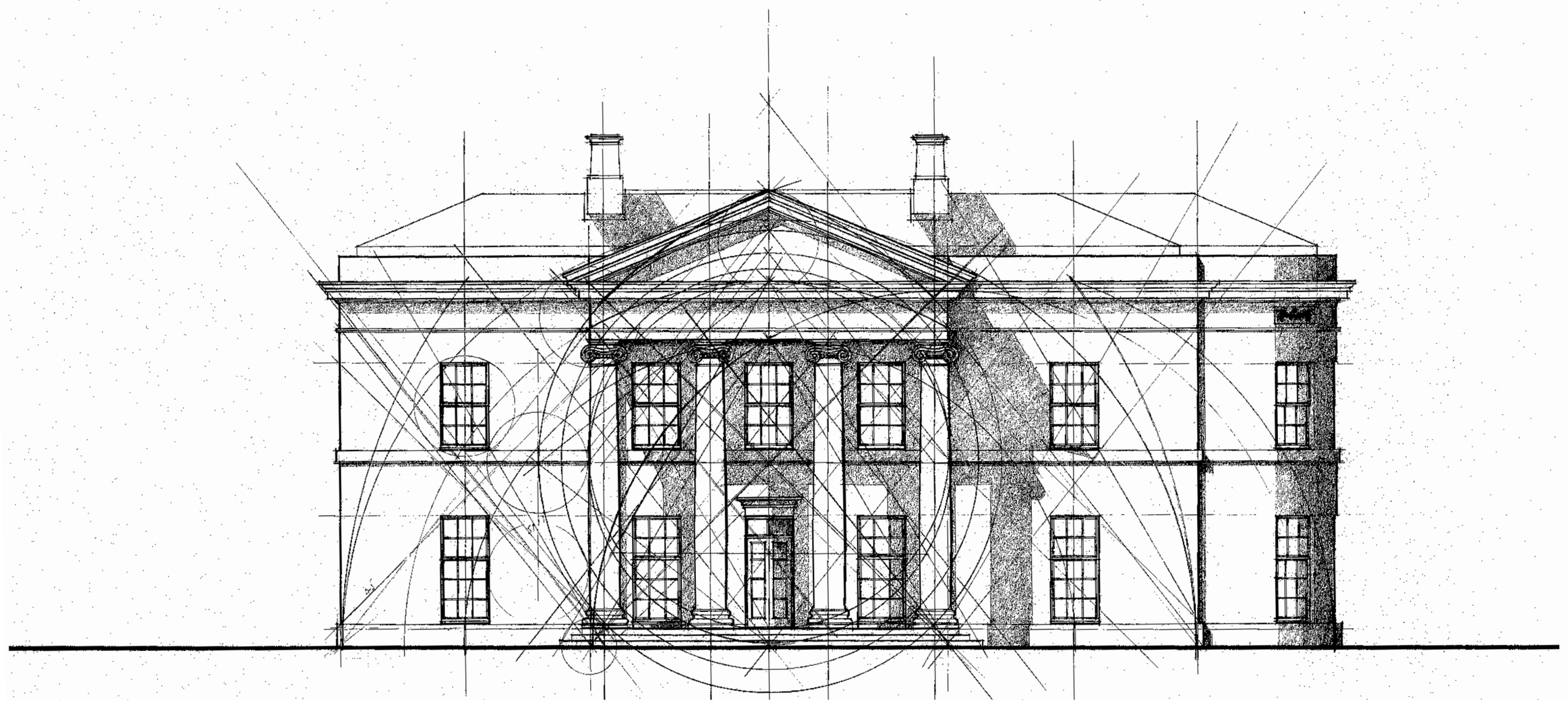
Germination of Vitruvian geometry

Figure 21



Germination diagram using the pyramid: 60°, Φ, 45° angles

Figure 22



Vitruvuan geometry: Germination diagram

Figure 23

North Elevation

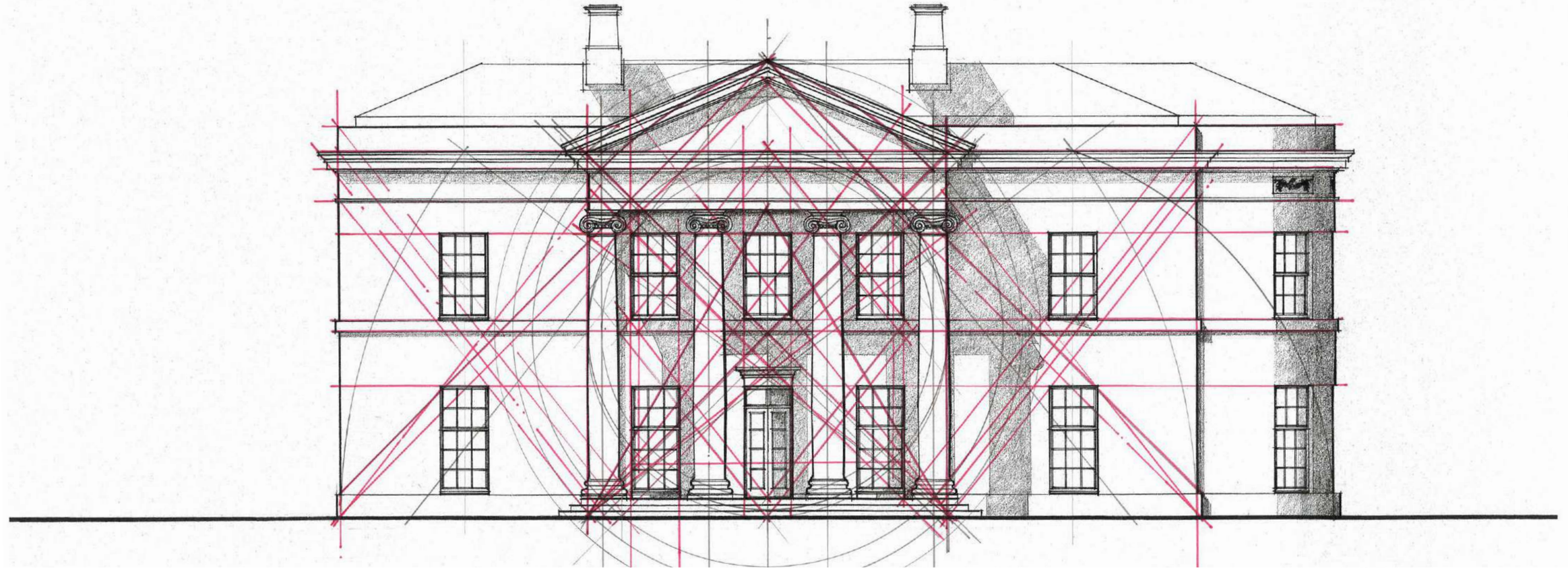
WOODFOLD VILLA

for Mr. Gressain

0 1 2 3 4 5 10 metres.

Germination geometry from Sand Reckoners diagram

Figure 24



Germination geometry of key proportions

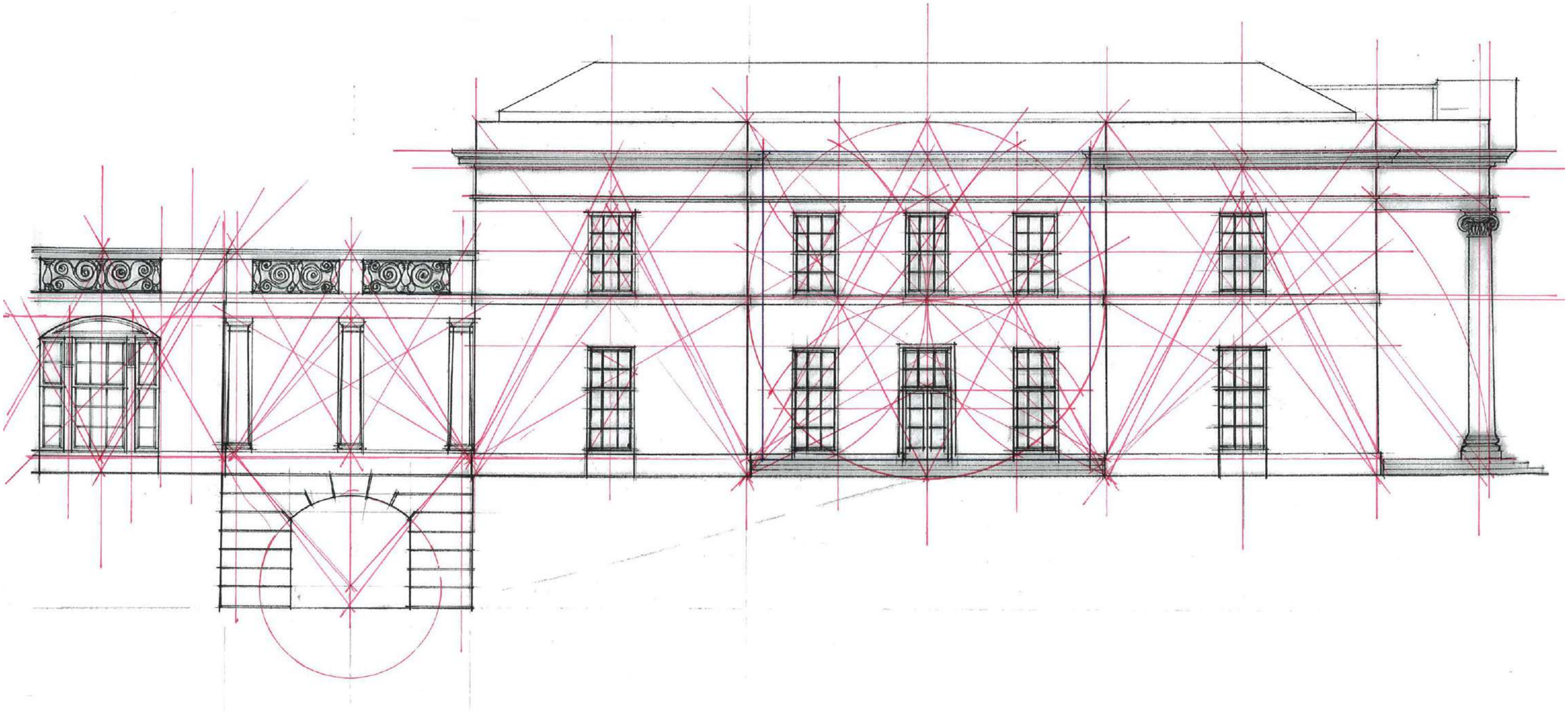
Figure 25

Germination of the pyramid 51° 51’

Figure 26

Germination of the 60° triangle

Figure 26



Squaring the circle, germination of Φ, the pyramid, 60° & 45° angles

Figure 27

Germination of 45°, pyramid (51°51'), 60° & Φ

Figure 28

Bibliography

Pythagorean Palaces ; Magic and Architecture in the Italian Renaissance. G. L. Hersey. Pub. 1976 Cornell University Press
The Lost Meaning of Classical Architecture. G.L. Hersey. Pub. 1988 The MIT Press
The Elements of Classical Architecture. Georges Gromort. Pub. 2001 Norton
Italian Renaissance Architecture, Georges Gromort. Pub A Vincent 1922
Classical Architecture : The Poetics of Order. Alexander Tzonis and Liane Lefaivre. Pub 1986 The MIT Press.
The Proportion in Architecture & A Theory of Proportion August Thiersch and Heinrich Wolfflin. Pub 2017 Keepahead Books
Beauty, Memory, Unity : A Theory of Proportion in Architecture and Design by Steve Bass. Pub 2019 Lindisfarne Books
Greek Architecture, by R. A. Tomlinson. Pub 1989 Bristol Classical Press
The Classical Language of Architecture, by John Summerson. Edition 1980 Thames and Hudson
The Orders, Pub. 1904 The American School of Correspondence, Chicago
Sacred Geometry; Philosophy and Practice. Robert Lawler. Pub. 1982 Thames and Hudson
Sacred Geometry, Miranda Lundy. Pub. 2006 Wooden Books
Gothic Cathedrals and Sacred Geometry. George Lesser. Pub. 1964 Alec Tiranti
Applications of the Golden Mean to Architecture In Meandering Through Mathematics. Nikos Angelos Salingaros. Austin, Texas, 2012. Pub.
Patterns Digital Library

Cesare Cesariano, 'Vitruvius's De Architectura' Pub 1521 Gottardo da Ponte
Petites Habitations, Jacques Androuet Du Cerceau Pub. c 1550
Sebastiano Serlio, The Five Books of Architecture. Pub 1611 Robert Peake (also known variously as the seven books)
Andrea Palladio, The Architecture in Four Books. Giacomo Leoni. Pub. 1715-20 (in two volumes) John Darby
Vitruvius Britannicus (or The British Architect) Colen Campbell. Pub 1715-25 (in three volumes)
Magnum in Parvo (or The Marrow of Architecture) William Halfpenny. Pub. 1728 J Wilcox
Lectures in Architecture. Robert Morris. Pub. 1734 by J Brindley
The Builders Jewel. Batty and Thomas Langley. 10th edition Pub 1763 (original 1743)

The Georgian Villa, edited by Dana Arnold, Pub. 1996 Alan Sutton
The Georgian Country House by Dana Arnold, Reprinted 2013 History Press
The Palladian Revival: Lord Burlington, His Villa and Garden at Chiswick. Pub 1995 Royal Academy of Arts
Sir Jeffrey Wyatville, Architect to the King, by Derek Linstrum. Pub 1972 Clarendon Press
James Wyatt, Architect to George 111, by Joh Martin Robinson. Pub 2012 Yale University Press
Decimus Burton, Paul A Rabbitts. Pub 2021 Lund Humphries
Architectural Drawings of the Regency Period by Giles Worsley. Pub 1991 Andre Deutsch
The Canon. William Stirling. Pub. 1897 Elkin Matthews
Rationalism in Architecture, (BA Thesis) Francis Shaw 1984
Sacred Geometry; Rosslyn Chapel and Freemasonry (MA Thesis) Francis Shaw 1988

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